Western Isles HVDC Link

EPS and Protected Species Risk Assessment

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Scottish & Southern Electricity Networks

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Acronyms

Acronym	Definition
AA	Appropriate Assessment
AUV	Autonomous Underwater Vehicle
dBht	Decibel Hearing Threshold
DDV	Drop Down Video
EDR	Effective Deterrence Range
EPS	European Protected Species
FCS	Favourable Conservation Status
HF	High-Frequency
HRA	Habitat Regulation Assessment
HVDC	High Voltage Direct Current
HWDT	Hebridean Whale and Dolphin Trust
IAMMWG	Inter-Agency Marine Mammal Working Group
IROPI	Imperative Reason of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
JUV	Jack-up Vessel
LF	Low-Frequency
LSE	Likely Significant Effects
MBES	Multi Beam Echo Sounder
MD-LOT	Marine Directorate Licensing and Operations Team
MHWS	Mean High Water Springs
MMO	Marine Mammal Observer

Acronym	Definition
MMMP	Marine Mammal Mitigation Protocol
NCMPA	Nature Conservation Marine Protection Area
NM	Nautical Mile
NMFS	National Marine Fisheries Service
OED	Offshore Exploratory Drilling
PAM	Passive Acoustic Monitoring
PCPT	Piezo Cone Penetration Testing
PSA	Particle Size Analysis
PTS	Permanent Threshold Shift
PW	Phocid Carnivores in Water
rms	Root Mean Square
ROV	Remote Operated Vehicle
SAC	Special Area of Conservation
SBP	Sub Bottom Profiler
SCANS	Small Cetaceans in European Atlantic Waters and the North Sea
SEL	Sound Exposure Level
SMR	Scottish Marine Region
SMWWC	The Scottish Marine Wildlife Watching Code
SPA	Special Protection Area
SPL	Sound Pressure Level
SSEN	Southern and Scottish Electricity Network
SSS	Side Scan Sonar
TSS	Temporary Threshold Shift

Acronym	Definition
UHRS	Ultra-High-Resolution Seismic
UKCS	United Kingdom Continental Shelf
UAV	Uncrewed Aerial Vehicle
USBL	Ultra-Short Baseline
UXO	Unexploded Ordinance
VHF	Very High Frequency
WCA	Wildlife and Countryside Act
WDC	Whale and Dolphin Conservation

1. Introduction

1.1. Project Overview

Scottish and Southern Electricity Networks – Transmission (SSEN Transmission) hold an Electricity Transmission Licence under the Electricity Act 1989 (as amended). SSEN Transmission are responsible for developing and maintaining an economical and efficient system for the transmission of electricity in the north of Scotland. Recently there has been an increase in renewable electricity generation in order to fulfil the Scottish Government and UK Government net zero targets; however, significant electricity network (grid) reinforcements are required to support this increased renewable electricity generation.

On the Isle of Lewis, two onshore wind farms are in development that require connections to the transmission network, but the existing Western Isles electricity network is at full capacity. The purpose of the Western Isles Connection Project is to reinforce the electrical network connection between the Western Isles and the Scottish Mainland and to provide increased capacity to accommodate generation from renewable energy projects on the Western Isles. This will be achieved by creating a new transmission link (Western Isles Link High Voltage Direct Current (HVDC) Link[1] the 'Project') between Arnish Point, approximately 2.5 km south of Stornoway on the Isle of Lewis, to Dundonnell, approximately 6 km south-west of Ullapool (Scottish Mainland).

SSEN Transmission undertook a geophysical survey for the Project in 2024 to inform refined cable routeing and design. Further surveys for the Project are planned for the next five years to enable SSEN Transmission to:

- Gather data on seabed bathymetry, seabed features, debris, anomalies and potential obstructions (including Unexploded Ordnance, UXO) to inform the final stages of cable routeing and design;
- Utilise survey equipment for the installation of the Project (e.g. use of Ultra-Short Baseline (USBL positioning equipment); and
- Undertake post-installation surveys and condition monitoring.

1.1.1. Survey Corridor

The Project will encompass an HVDC cable of approximately 81 km in length from Arnish Point on the Isle of Lewis to Dundonnell on the Scottish Mainland (Figure 1). The survey corridor begins within the Outer Hebrides Scottish Marine Region (SMR), and then crosses the Minch and enters the West Highlands SMR. All geophysical and geotechnical survey activities will occur within the survey corridor, and thus the survey corridor represents the extent of the applied for European Protected Species (EPS) Licence boundary. The coordinates for the survey corridor are provided in Appendix A.

[1] Marine Licence ID: MS-00008738. Available online at: https://marine.gov.scot/ml/marine-licence-installation-hvdc-interconnector-western-isles-mainland-scotland-0682100008738

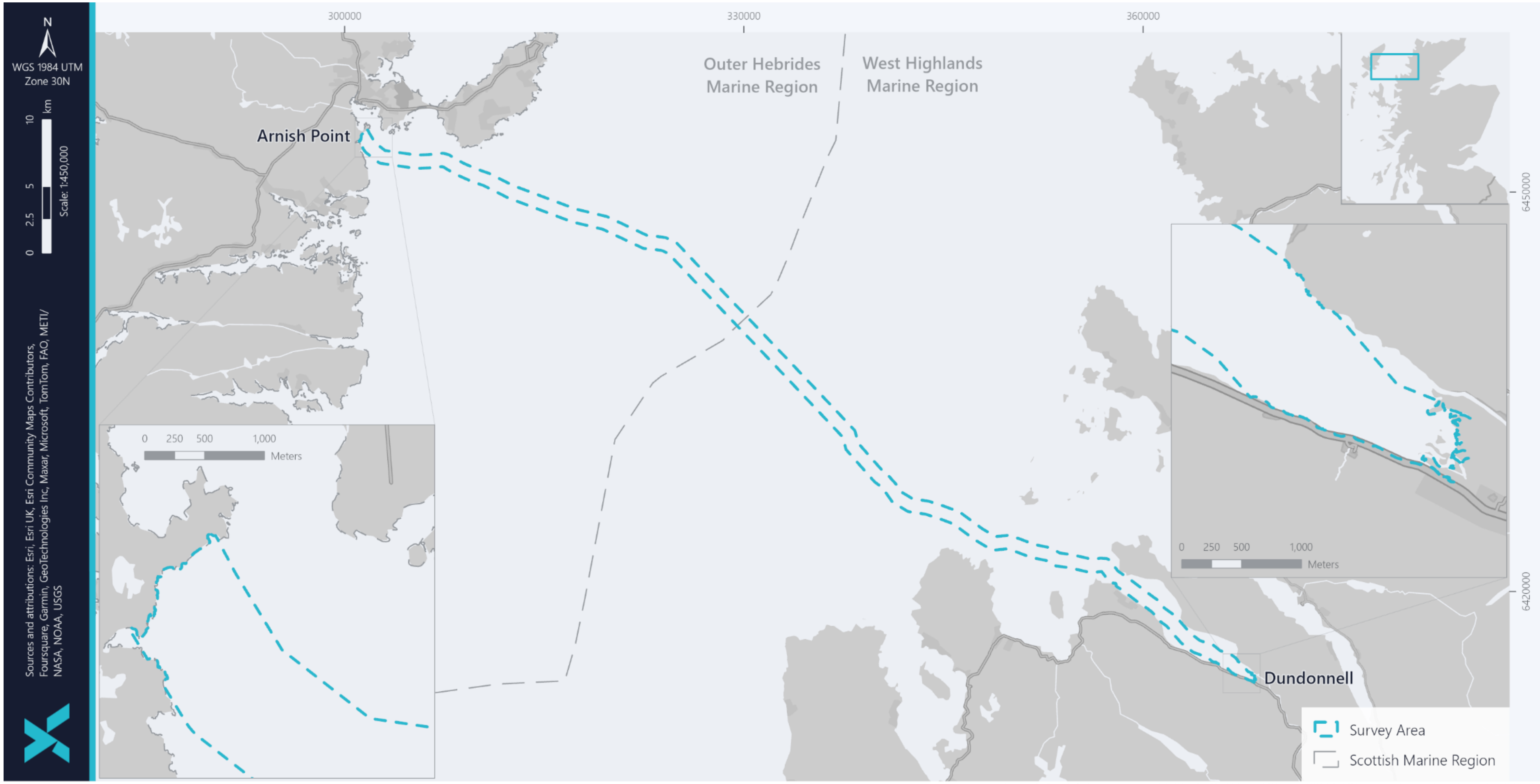


Figure 1 Survey area

1.2. Report Purpose

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

1. An assessment of potential impacts on cetaceans and otters, 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 EPS Risk Assessment to support the application;
2. An assessment of potential impacts on basking sharks, and determination of whether a derogation licence will be required under the Wildlife and Countryside Act 1981 (as amended);
3. An assessment of the potential for Likely Significant Effects (LSE) on protected sites as required by the Habitats Regulations, the Marine (Scotland) Act 2010; and
4. An assessment of the potential to harass (intentionally or recklessly) any seals at designated seal haul-outs, as defined by section 117 of the Marine (Scotland) Act 2010 and the Protection of Seals (Designation of Haul-Out Sites) (Scotland) Amendment Order 2017.

1.3. Protected Species Overview

1.3.1. European Protected Species (Cetacean and Otters)

All species of cetacean (i.e., whale, dolphin and porpoise) occurring in UK waters and the Eurasian otter (*Lutra lutra*) are listed in Annex IV of the Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna) as EPS. This provision identifies all cetaceans and otters as species of community interest in need of strict protection, as per Article 12 of the Directive. Harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin (*Tursiops truncatus*) are listed as individual species under Annex II of the Habitats directive, which enables the designation of Special Area of Conservation (SACs) for those species, while all other cetaceans are listed as “All other Cetacea” in Annex IV.

Although the UK is no longer part of the European Union (EU), in Scotland, the Habitats Directive is transposed into law by the Conservation (Natural Habitats, &C.) Regulations 1994 (as amended) (‘the Habitats Regulations’) within Scottish Territorial Waters (12 Nautical Mile (NM) Limit). These regulations are still in force following the UK’s withdrawal from the EU, meaning the strict protections for EPS remain, as per the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019. An EPS Licence is required where any activity may result in an offence under the Habitats Regulations, which in the context of the marine surveys, pertains to cetaceans and otters. Part III of the Habitats Regulations defines what is considered an offence, in terms of human interactions with EPS. Regulation 39 (1) and (2) describe what constitutes as an offence, as follows:

1. It is an offence:
    a. To deliberately or recklessly capture, injure or kill a wild animal of a EPS;
    b. To deliberately or recklessly:
        i. harass a wild animal or group of wild animals of a European protected species;
        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; or

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.

c. To deliberately or recklessly take or destroy eggs of such an animal; or

d. To damage or destroy a breeding site or resting place of such an animal.

2. Subject to the provisions of this Part, it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean).

An EPS Licence for the survey activities will therefore be required for: (1) any activity that might result in injury to any cetacean or otter EPS; (2) any activity which results in disturbance to any individual cetacean within Scottish territorial waters and/or; (3) any population of otters, as stated in the Regulation 39 (1)(v) above.

1.3.1.1. Determining the Need for an EPS Licence

The purpose of the assessments presented in this report is to determine whether, when considering the implementation of appropriate mitigation, there is the potential for the marine survey activities to injure or disturb cetaceans or otters. Where the potential for disturbance remains, an EPS Licence may be required. The requirement for an EPS Licence will be determined based on findings from the EPS Risk Assessment.

If an EPS licence is required, Marine Directorate - Licensing Operation Team's (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 Habitat Regulations;
2. To ascertain that 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 (FCS).

1.3.1.2. The Eurasian Otter

The Eurasian otter is the only native UK otter species and is fully protected as an EPS and under Section 9 and 11 of the Wildlife and Countryside Act (WCA) 1981 (as amended). When considering a certain activity, the presence of an otter as an EPS is a material consideration if the proposals are likely to result in the disturbance or harm to the species.

Otters may be disturbed by the presence of vessels but are not particularly sensitive to any sound emissions from the survey activities. Importantly, the surveys will only take place for a short period of time in the nearshore area. With the implementation of appropriate mitigation measures, as outlined in Section 5, the risk of disturbance to otters is considered to be extremely limited and will not constitute as an offence under the Habitat Regulations. Hence, an EPS Licence for otters will not be required. This species will not be considered further within this assessment, except within the protected sites impact assessment (Section 4) for the assessment of potential LSE on otters as a qualifying feature of an SAC, if required.

1.3.2. Basking Sharks

Basking sharks (*Cetorhinus maximus*) are protected under Schedule 5 of the WCA which prohibits the killing, injuring or taking by any method of those wild animals listed on Schedule 5 of the Act. The Nature Conservation (Scotland) Act 2004, Part 3 and Schedule 6 make amendments to the WCA, strengthening the legal protection for threatened species to include 'reckless' acts, and specifically make it an offence to intentionally or recklessly disturb or harass basking sharks. A derogation licence under the WCA will therefore be required for any activity which may result in disturbance or injury to basking sharks.

An assessment of potential impacts on basking sharks, to determine whether a derogation licence is required under the Wildlife and Countryside Act 1981 (as amended) is provided in Section 3.

1.3.3. Pinnipeds

The Marine (Scotland) Act 2010 protects both harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*) around Scotland's coast, as well as providing specific protection against harassment (intentional or reckless) at their haul out sites as defined by the Protection of Seals (Designated of Haul-Out Sites) (Scotland) Order 2014 which identifies 194 designated haul-out sites (see Section 1.4.3). The Habitats Regulations provides additional protection for grey and harbour seals, as both species are listed under Annex II of the Habitats Directive, requiring the designation of SACs for these species.

1.3.4. Seabirds

The primary legislation for the protection of birds in the UK is the WCA in combination with the Nature Conservation (Scotland) Act 2004. Under these acts, it is an offence to harm wild bird species, their eggs and nests. Additional protection is provided for certain bird species listed on Schedule 1 of the WCA, and it is an offence to disturb those species at their nest while it is in use.

The proposed development activities are unlikely to result in the intentional or reckless killing of wild birds or the destruction of their nests, but if carried out during the breeding season, such works could result in an offence by disturbing nesting Schedule 1 bird species. Licensing for wild birds does not cover development purposes, so any activity that could result in disturbance of a nesting Schedule 1 species should not proceed unless out-with the breeding season. There are no schedule 1 bird breeding sites in the vicinity of the marine survey corridor, as such seabird will not be considered further by this assessment, except as a qualifying feature of relevant designated sites (Section 1.4).

1.4. Protected Sites Overview

1.4.1. European Sites

The EU Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC) designates SACs and Special Protection Areas (SPAs) ('European sites') for the conservation of habitats and species across Europe, forming the UK's European site network. The Habitats Directive granted protection to habitats and species through the designation of SACs for Annex II species. The Birds Directive protects all wild birds (including migratory species) and their nests, eggs and habitats through the classification of SPAs.

In the UK, European sites have been designated as part of the UK National Site Network by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. In Scotland, the EU Habitats and Birds Directives have been transposed into Scottish law by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) for Scottish territorial waters (from Mean High Water Springs (MHWS) to 12 NM).

The Habitats Directive aims to promote the maintenance of biodiversity, through a requirement to maintain or restore representative natural habitats and wild species at a FCS, through the introduction of robust protection for those habitats and species of conservation importance.

As part of these protection measures, Competent Authorities are required to undertake assessments to determine whether a plan or project is likely to have an adverse effect on the integrity of a European site. This is implemented in Scotland through the Habitats Regulations Appraisal (HRA) process. The HRA process mandates that any proposal which has the potential to result in a negative LSE to a European site or its designated features, is subject to an HRA by the Competent Authority. If required, an Appropriate Assessment (AA) will also be conducted. The HRA process ensures that no activity can be consented if it may cause adverse effects on the integrity of a European site, unless there are no satisfactory alternatives, and there is an Imperative Reason of Overriding Public Interest (IROPI) for the activity to proceed. If it is necessary to apply for an EPS licence, this report will provide sufficient detail to support the HRA process.

1.4.2. Nature Conservation Marine Protected Areas (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 an activity 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 licence, sufficient detail will be provided to allow MD-LOT to ascertain potential effects on NCMPAs.

1.4.3. Designated Seal Haul-Outs

Seal haul-outs are coastal locations that seals use to breed, moult and rest. There are 194 seal haul-out sites that have been designated through the Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014, as amended with additional sites in 2017. These haul-out sites are protected under Section 117 of the Marine (Scotland) Act 2010 and have been designated to strengthen the protection of seals on land, when they are at their most vulnerable and, as such, provides additional protection from intentional or reckless harassment whilst seals occupy these important coastal sites.

1.4.4. Selection Criteria for Protected Sites

The potential impacts from the proposed survey activities associated with the Project need to be considered with respect to protected sites (including designated seal haul-outs), as well as on protected species. The following criteria has been used to select those protected sites 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 corridor;
- SACs (including proposed and candidate sites) with harbour seal features within 50 km of the proposed EPS Licence Boundary and breeding grey seal within 20 km of the proposed survey corridor;
- Designated seal haul-outs or seal breeding sites that overlap with or located within 500 m of the proposed survey corridor;
- 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 corridor;
- SACs and NCMPAs (including proposed and candidate sites) with benthic interests which are within the proposed survey corridor; and
- SACs and NCMPAs (including proposed and candidate sites) with otter features that overlap with or located within 500 m of the proposed survey corridor.

2. Description of Project Activities

2.1. Overview

The proposed geophysical, benthic, and geotechnical surveys are required to assess and characterise seabed and benthic conditions. This will include the identification of potential sensitive features or habitats and technical constraints. The surveys will inform detailed cable and route engineering, as well as supporting the wider installation and post installation phases of the Project, including as-built surveys.

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 1. It is anticipated that the testing and calibration will take approximately 24 hours per vessel per survey mobilisation.

The exact location of the testing and calibration sites is unknown at this stage, where possible this would be undertaken within the survey corridor. It is however noted that specific bathymetric conditions and features are required to facilitate testing and calibration; where these are not available within the survey corridor, an alternative location will be utilised.

Since the vessels, 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 and therefore are not specifically assessed.

2.1.2. Survey Activities

The surveys will typically be carried out by six vessel and/or vehicle types:

- A large general purpose survey vessel in offshore waters;
- Jack-up Vessel (JUV) in nearshore waters;
- A smaller nearshore survey vessel (<24 m);
- Autonomous Underwater Vehicle (AUV);
- Uncrewed Aerial Vehicle (UAV); and
- Uncrewed Surface Vessel (USV) in nearshore waters.

The impacts are not considered to differ between nearshore and offshore survey campaigns. As such, only one assessment has been undertaken to inform the EPS and protected sites risk assessment.

Survey vessel selection will be made prior to survey operations commencing, and will be informed by a number of factors. These include environmental considerations, weather and sea state, survey requirements and water depth. In addition to the survey vessels there may also be small supporting vessels in attendance, depending on the activity.

Table 1 presents the types of activity that are associated with the geophysical, geotechnical and environmental surveys.

Table 1 Summary of the Survey Activities

Activities	
Vessels and Vehicles	Survey Vessel(s)
	Remotely Operated Vehicle (ROV)
	Uncrewed Surface Vehicle (USV)
	Autonomous Underwater Vehicle (AUV)
	Jack-up Vessel (JUV)
	Uncrewed Aerial Vehicle (UAV)
Geophysical Survey	Ultra-Short Baseline (USBL) positioning system
	Side Scan Sonar (SSS)
	Multi Beam Echosounder (MBES)
	Sub-bottom Profiler (SBP)
	Ultra-High-Resolution Seismic (UHRS) system (boomer/sparker)
	Magnetometer
	Cable tracker system
Benthic Survey	ROV Survey/ inspection
	Drop Down Video (DDV)/ photography
	Benthic sediment sampling
Geotechnical Survey	Vibrocoring
	Piezo Cone Penetration Testing (PCPT)
	Percussive Boreholes

2.1.3. Survey Equipment

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

Table 2 Details of the Equipment to be Employed for the Survey Activities

SYSTEM / SURVEY EQUIPMENT	DESCRIPTION
Geophysical Survey	
Ultra-Short Baseline (USBL)	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.
Multi-beam echosounder (MBES)	MBES is 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 the Project's survey activities, the MBES specifications are to be high resolution.
Side-Scan Sonar (SSS)	SSS is used to generate an accurate image of the seabed, which may include 3D imagery. An acoustic beam is used to obtain an accurate image of a narrow area of seabed to either side of the instrument by measuring the amplitude of back-scattered return signals. The instrument can either be towed behind a ship at a specified depth or mounted on to a 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.
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 and chirpers. 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.

SYSTEM / SURVEY EQUIPMENT	DESCRIPTION
Ultra-High-Resolution Seismic (UHRS) system	UHRS systems are optimised to achieve a sub-bed penetration depth focusing on the depth range of 10–1,000 m below seafloor. This technology requires a controlled seismic source of energy connected by high voltage cable to a sound source that transfers the energy through the water to penetrate the seabed. The energy reflected back from the different sediment layers below the seabed is received by hydrophones on the sea surface, recorded and processed by a data acquisition system aboard a vessel, so that visual profile of the seabed can be created. There are numerous UHRS technologies which may be deployed during survey operations, including both boomers, and sparkers. A seismic sparker works by discharging an electrical pulse between electrodes and a grounding point in seawater. This discharge creates an acoustic pulse, and the reflected signal is received by a hydrophone deployed at a set distance from the source.
Magnetometer	Magnetometer surveys are used to detect any ferrous metal objects on the seabed, such as wrecks, Unexploded Ordnance (UXO), or any other obstructions. Marine magnetometers come in two types: surface-towed and near-bottom. Both are towed a sufficient distance (at least two ship lengths) away from the vessel to allow them to collect data without it being influenced by the ship's magnetic properties. Surface towed magnetometers allow for a wider range of detection at the price of precision accuracy that is afforded by the near-bottom magnetometers. These surveys use equipment to record spatial variation in the Earth's magnetic field. This equipment does not generate underwater sound as a part of its normal operations and is therefore not considered to pose any risk of injury or disturbance to cetaceans.
Cable tracker system (e.g. TSS 350/440)	Cable tracker survey systems provide positional data on surface laid or buried pipes and cables. It is used to verify the location and burial status of cables and can provide precise details of fault locations. This equipment does not generate underwater sound and is therefore not considered to pose any risk of injury or disturbance to cetaceans.
Benthic Survey	
Remotely Operated Vehicle (ROV survey)	An ROV mounted camera will be utilised to acquire imagery of the seabed. This survey equipment does not interact with the seabed or result in underwater sound emissions and as such does not require any further consideration by this assessment. USBL may be used to monitor the position of the ROVs and other sub-sea equipment.

SYSTEM / SURVEY EQUIPMENT	DESCRIPTION
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. It is required to provide detail on epifaunal species (animals living on the surface of the substrate), habitats and geological features. Drop down cameras do 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. USBL may be used to monitor the position of the camera unit.
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). 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. USBL may be used to monitor the position of the grab sampler.
Geotechnical Survey	
Vibrocore / Piezocone Penetration testing (PCPT)	Vibrocoring operations will be undertaken using a high power vibrocorer which will be deployed from both the offshore and nearshore vessels. The PCPT will be carried out from both the offshore and nearshore vessels using piezocones that will be pushed into the seabed to collect samples in order to allow determination of the geotechnical engineering properties of the sediment and delineation of the seabed stratigraphy. The vibrocoring equipment, including PCPT, does not have the potential to generate significant levels of sound. Therefore, this technology does not require any further consideration with respect to possible injury or disturbance to protected species and sites. Note that USBL beacons are often mounted on this equipment to determine position. Emissions from USBL have been considered within this assessment.

SYSTEM / SURVEY EQUIPMENT	DESCRIPTION
Percussive boreholes	Percussive boreholes may be undertaken in the nearshore to inform landfall design. Boreholes are used to penetrate beneath the seabed using a downhole sampling technique to provide a profile of soil characteristics. For percussive boreholes, a borehole casing is lowered into the seabed to the desired depth (typically down to rock) using a percussive technique (e.g. hammering). Following this, the soil structure is liquified using a vibrating technique and a drill rod is lowered inside the borehole casing to obtain cylindrical sediment samples (Huang *et al*., 2023). As the boreholes may be collected using a percussive technique, there is the potential for impulsive underwater sound to be emitted.

2.2. Activity Schedule

The survey activities are scheduled to be undertaken sometime between 1st July 2025 and 31st December 2030, and when all relevant consents are in place. The survey activities will be undertaken in distinct campaigns of between 3 and 20 days in duration each year, with an estimated total survey time of 68 days. For all survey activities, no allowance for time has been included for the following categories as estimation of these is considered to be beyond the reasonable limits of the assessment:

- Third party activities within the region (e.g., fishing and other sea users);
- Technical equipment issues;
- Waiting on weather;
- Environmental mitigation standby; and
- Force majeure.

Nonetheless each has the potential to impact on delivery of the survey scope and increase the overall timescale of the surveys.

3. EPS and Basking Shark Impact Assessment

The primary function of this EPS Risk Assessment is to determine whether an EPS licence is required for the proposed survey works, by identifying the potential for injury and disturbance to EPS. This section of the risk assessment addresses potential impacts to EPS 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. Although not classified as EPS, an assessment of underwater sound impacts to pinnipeds, including sound modelling, and seabirds has been included in this section to support the protected sites impact assessment undertaken in Section 4.

Underwater sound emissions from geophysical survey equipment are the primary source of potential injury and disturbance to EPS. It is acknowledged that underwater sound emitted by the survey vessel and the physical presence of the vessels during the survey operations also has the potential to cause disturbance to EPS and pinnipeds.

An overview of survey activities and their potential impacts to EPS and pinnipeds is provided in Table 3 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 pinnipeds, and have been screened out of the detailed assessment, as indicated in Table 3.

An assessment of potential impacts to basking sharks is provided in Section 3.5 to determine the requirement for a basking shark derogation licence.

Table 3 Overview of Potential Impacts of Marine Survey Equipment on EPS and Pinnipeds within the Vicinity of the Survey Corridor

ACTIVITY / EQUIPMENT	EXAMPLE EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (kHz)	INDICATIVE SPL[2] (dB re 1µPa)	FURTHER INFORMATION REQUIRED FOR EPS RISK ASSESSMENT?
Vessels and Vehicles					
Survey vessels	Various	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 routes 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 a small number of survey vessels in the region does not constitute a change from baseline conditions. It is acknowledged that vessels pose a potential collision risk to EPS and other protected species. While this does not constitute a change from baseline, all vessels will adhere to The Scottish Marine Wildlife Watching Code (SMWWC) (NatureScot, 2017), as detailed in Section 5.
Uncrewed Surface Vehicle (USV)	Various	USVs are controlled and maneuvered using batteries which power propellers and thrusters. Sound generated by USVs is similar to other vessels (i.e., continuous and broadband) but reduced in power due to their smaller size.			
Remotely Operated Vehicle (ROV) and Autonomous Underwater Vehicle (AUV)	Various	Potential impacts to EPS and other marine mammals include disturbance from sound emissions associated with movements underwater. However, these are anticipated to be limited in scale, given the small size of the submerged vehicles. Collision risk is considered an unlikely impact, given the high level of manoeuvrability and slow movement associated with ROVs.	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	HIPAP 501; Ranger USBL	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)	Edge Tech 4200/4205	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	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 5. Hence, no potential for injury or disturbance exists (NOAA, 2018).
Multibeam echosounder (MBES)	R2Sonic 2024; Reson 7125	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	180 – 240	**No** – The MBES 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 5. Hence, no potential for injury or disturbance exists (NOAA, 2018).

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

ACTIVITY / EQUIPMENT	EXAMPLE EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (kHz)	INDICATIVE SPL[2] (dB re 1µPa)	FURTHER INFORMATION REQUIRED FOR EPS RISK ASSESSMENT?
Sub-bottom Profiling (SBP)	EdgeTech 2000 series (Chirp) Innomar SBP 2000 series (Pinger)	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 and chirpers.	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.
Ultra-High-Resolution Seismic (UHRS) System	The Dura-Spark; The Dura-Spark UHD 240/400	An Ultra-High Resolution Seismic system is optimised to achieve a sub-bed penetration depth focusing on the depth range of 10–1,000 m below seafloor. This technology requires a controlled seismic source of energy connected by high voltage cable to a sound source (boomer or sparker) that transfers the energy through the water to penetrate the seabed. The energy reflected back from the solid seabed layers is received by hydrophones on the sea surface, recorded and processed by a data acquisition system aboard a vessel, so that visual profile of the seabed can be created.	0.1 – 6	216 – 250	**Yes –** The frequency of the sound emissions is within marine mammal hearing ranges and the source pressure level may pose a risk of injury and disturbance to EPS.
Geotechnical Surveys					
Percussive boreholes	Various	Boreholes penetrate beneath the seabed using a downhole sampling technique. A percussive technique is used for this equipment to hammer the borehole casings to the desired depth. The borehole casings are also vibrated to liquify the soil structure and drilling is completed to obtain the cylindrical samples. Huang *et al*. (2023) recorded that the dominant frequency for hammering of borehole casings was 10 kHz.	1 – 64 (dominant frequency below 10 kHz) (hammering) 0.041 (vibrating; dominant frequency) 0.045 (drilling; dominant frequency)	206-216 (hammering) 162 – 172 (vibrating) 162 - 180 (drilling)	**Yes -** The frequency of the sound emissions is within marine mammal hearing ranges and the source pressure level may pose a risk of injury and disturbance to EPS.

3.1. Cetacean Baseline

All cetacean species within UK waters are deemed ‘species of community interest’ under Annex IV of the Habitats Directive and thus require strict protection as EPS. The strict protection to all cetaceans as EPS is enshrined in domestic legislation through the Habitats Regulations, while bottlenose dolphin and harbour porpoise have further protection under Annex II of the Habitats directive, which requires the designation of SACs for those species.

Around 20 species of cetacean have been recorded around the Outer Hebrides and West Highlands Marine Regions, with frequent sightings of harbour porpoise, white-beaked dolphin (*Lagenorhynchus albirostris*), minke whale (*Balaenoptera acutorostrata*), Risso’s dolphin (*Grampus griseus*), common dolphin (*Delphinus delphis*), in addition to a resident population of bottlenose dolphin, and occasional summer sightings of killer whale (*Orcinus orca*) (Hebridean Whale and Dolphin Trust (HWDT), 2018; Department for Business, Energy, & Industrial Strategy (BEIS), 2022). The distribution, density, and abundance of the most commonly occurring cetacean species around the Outer Hebrides and West Highland Marine Regions are described below and summarised in Table 4.

- **Harbour porpoise** is the most abundant cetacean species in UK waters and are generally observed in small groups of one to three individuals (Hague *et al.,* 2020). Harbour porpoises are commonly sighted on the west coast of Scotland year-round (HWDT, 2018). Sightings in the Minches and western Scotland peak in the summer months between June and September (BEIS, 2022). Sightings of harbour porpoise are generally widespread across western Scotland across most coastal areas of the Inner and Outer Hebrides. This region is generally considered to be one of the most important areas for harbour porpoise in Europe, which is reflected in the designation of the Inner Hebrides and the Minches SAC which the survey corridor overlaps (HWDT, 2018). The density of harbour porpoise within Block CS-H of the of the Small Cetaceans in European Atlantic Waters and North Sea (SCANS-IV) survey was approximately 0.3911 animals/km^2, which is average in the context of the wider United Kingdom Continental Shelf (UKCS) region (Gilles *et al.,* 2023). The Inner Hebrides and the Minches SAC revised site population estimate was between 3,030 and 9,128 individuals based on the SCANS-IV survey (NatureScot, 2023a). The abundance estimate for harbour porpoise in the West Scotland management unit is approximately 28,936 (Inter-Agency Marine Mammal Working Group (IAMMWG), 2023).
- **Bottlenose dolphin** are primarily sighted in small numbers around the Hebrides; however, they have been reported in the Outer Hebrides around the Sound of Barra and occasionally in the northern entrance to the Minch (BEIS, 2022). Sightings are generally concentrated in coastal areas close to shore and around headlands and bays (HWDT, 2018). Surveys conducted by HWDT suggest a resident population of approximately 30 – 40 individuals inhabit the Inner Hebrides with a separate resident population of around 12 animals in the Sound of Barra (HWDT, 2024). The density of bottlenose dolphins within Block CS-H of the SCANS-IV survey was approximately 0.3421 animals/km^2 (Gilles *et al.,* 2023). The abundance estimate for bottlenose dolphin in the Coastal West Scotland and Hebrides management unit is 45 (IAMMWG, 2023). The proportion of the Central West Scotland and Hebrides management unit potentially present in the survey corridor is calculated as 61.65% (Table 4), based on SCANS-IV density estimates. This high percentage reflects the low abundance estimate for the Coastal West Scotland and Hebrides management unit (45 individuals). However, according to HWDT sightings, the majority of sightings of this species are within the Sound of Barra and not in close proximity to the survey corridor.
- **Risso’s dolphin** is common in deeper, offshore waters (Hague *et al*., 2020). In the Hebrides, there is deep water found close to shore, including around the north-east coast of Lewis and this species is regularly observed close to this coast (HWDT, 2018). Risso’s dolphin are typically observed in small groups of 5 to 25 individuals during the summer months from June to September. The north of the Isle of Lewis has been identified as an area of relatively high density (Paxton *et al.,* 2014), and thus the North-east Lewis NCMPA

has been designated for Risso's dolphin, which the survey corridor overlaps. The density estimate available for Risso's dolphin in Block CS-H from the SCANS-IV survey is 0.0244 animals/km^2 (Gilles *et al.,* 2023). The abundance estimate for Risso's dolphin in the Central and Greater North Sea (CGNS) management unit is 12,262 (IAMMWG, 2023). A boat-based survey between 2010 and 2017 estimated a minimum population size of 117 dolphins present within the North-east Lewis NCMPA (Weir *et al.*, 2019).

- **Minke whale** is the smallest, most abundant baleen whale to be sighted in Scottish waters (HWDT, 2018). Minke whales are considered seasonal visitors in the Minches and western Scotland, present from May through October with a peak in sightings between July and September. There is a high density of minke whale in the Sea of Hebrides and to the south and west of the Hebrides, and this species is frequently observed in this region. The Sea of the Hebrides NCMPA has been designated for minke whale, which is located over 50 km south of the survey corridor. The density of minke whale in Block CS-H of the SCANS-IV survey is considered to be moderate to high in comparison to the rest of the UKCS, with an estimate of 0.0353 animals/km^2 (Giles *et al.,* 2023). The abundance estimate for the CGNS management unit is 20,118 (IAMMWG, 2023).
- **Common dolphin** is considered a primarily offshore species, but over the past decade there has been an increase in sightings in the Hebrides, and common dolphins are now the most commonly sighted cetacean in the Sea of Hebrides and the Minch (HWDT, 2018). Sightings data indicates that this species is a summer visitor to the region, with a peak in sightings from April to October, and significantly fewer sightings occurring in the winter months (HWDT, 2018). The density of common dolphin in Block CS-H of the SCANS-IV survey was 0.9266 animals/km^2 (Gilles *et al*., 2023). The abundance estimate for the CGNS management unit is 102,656 (IAMMWG, 2023).
- **White-beaked dolphin** have a widespread distribution and are frequently recorded in the North Minch, between the Isle of Lewis and mainland Scotland, although they tend to be observed more frequently in offshore waters. White-beaked dolphin sightings are common in the northern part of the Minch and west of the Outer Hebrides, with the most numerous sightings between June to October. The density estimate for white-beaked dolphin in Block CS-H of the SCANS-IV survey is 0.1380 animals / km^2 (Gilles *et al.,* 2023). The abundance estimate for the CGNS management unit is 43,951 (IAMMWG, 2023).
- Other species, such as white-sided dolphin (Lagenorhynchus acutus), killer whale, fin whale (Balaenoptera physalus) and humpback whale (Megaptera novaeangliae) have been recorded in the summer months (BEIS, 2022). In recent years, killer whale sightings have been increasing around the Hebrides (BEIS, 2022), with the HWDT reporting the presence of killer whales year-round (known as the West Coast Community) (HWDT, 2018).

Table 4 Population Parameters of Cetacean Species Potentially Present in the Survey Corridor (Gilles *et al*., 2023; IAMMWG, 2022)

Species Name	Estimated Area Density (Individuals / km^2)*	Estimated Abundance in the Survey Corridor (81.1 km^2)	Management Unit (MU) / Biogeographical Population Estimate	Proportion Of the MU Potentially Present in the Survey Corridor (%)
Harbour porpoise	0.3911	31.72	28,936	0.11
Bottlenose dolphin	0.3421	27.74	45	61.65
Risso's dolphin	0.0244	1.98	12,262	0.02
Minke whale	0.0353	2.86	20,118	0.01
Common dolphin	0.9266	75.15	102,656	0.07
White-beaked dolphin	0.1380	11.19	43,951	0.03
White-sided dolphin	0.0279	2.26	18,128	0.01

** Density estimates are taken from SCANS-IV Survey Block CS-H.*

3.2. Potential Impact from Survey Activities

Sound emissions generated from the proposed survey activities pose the greatest potential risk of injury or disturbance to cetaceans and pinnipeds in the surrounding area. Underwater sound can impact cetaceans in the following ways:

- **Injury** – physiological damage to auditory or other internal organs; and
- **Disturbance (temporary or continuous)** – disruptions to behavioural patterns, such as migration, breathing, nursing, breeding, foraging, socialising and / or sheltering.

To assess the potential sound impacts on cetaceans and pinnipeds, predicted emission levels are compared to available estimated thresholds for injury and disturbance. Several threshold criteria and methods exist for determining how marine mammals perceive sound, such as the dBht method and other hearing-weighted and linear measures, each with its own advantages and disadvantage. The Scottish Government (2020) guidance recommends using the injury and disturbance criteria proposed by Southall *et al.* (2007), which combine linear (un-weighted) peak Sound Pressure Levels (SPL) and weighted Sound Exposure Levels (SEL). Since this seminal paper was published, new evidence on marine mammal auditory abilities in both novel and well-studied species (e.g., harbour porpoise) has led to updates in the auditory thresholds for injury (NOAA, 2018; Southall *et al.*, 2019). Following recent regulator feedback, these updated hearing groups and thresholds for acoustic injury have been adopted here and are detailed in Table 5 below.

If a sound emission contains frequencies outside the estimated auditory bandwidth of a given species, disturbance or injury is highly unlikely. To evaluate potential sound-related impacts, the likely hearing sensitivities of different cetacean hearing groups are summarized in Table 5. This summary forms the basis for excluding SSS and MBES from further assessment, as detailed in Table 3.

Table 5 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, fin 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., harbour porpoises and other 'true' porpoises)	275 Hz to 160 kHz
Phocid carnivores in water (PW): (e.g., earless, or 'true' seals, such as grey and harbour seals)	75 Hz to 100 kHz

3.3. Sound Assessment Criteria

This section outlines the sound assessment criteria used to evaluate sound-related impacts on EPS and pinnipeds. Underwater sound modelling was conducted using Xodus' SubsoniX model for all underwater sound sources with the exception of percussive boreholes. For the assessment of percussive boreholes, the recent field measurement and associated modelling results presented in Huang *et al.* (2023) have been used to inform the assessment of sound-related impacts. A summary of the methodology used in Huang *et al.* (2023) is provided in Section 3.4.1.

3.3.1. Injury

The proposed injury criteria recommended by NOAA (2018) and Southall *et al*. (2019) are defined for two types of sound:

- **Impulsive:** sounds which are short in duration (*i.e.,* less than one 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 surveys will use acoustic equipment which emit multiple pulsed sounds, as detailed in Table 3. The sound emissions generated from this equipment will disperse through the water column, with sound pressure decreasing as the distance from the source increases. Therefore, marine mammals will be exposed to a lower sound pressure the further they are located from the sound source. To assess the potential for injury or disturbance, the dispersion of sound through the water column has been modelled to determine the appropriate mitigation zone, ensuring that the received sound pressure levels are reduced below potentially injurious levels for marine mammals.

A dual-metric approach has been adopted to identify the potential injury range for marine mammals, based on source levels including peak pressure and cumulative SELs for each equipment type requiring consideration for sound-related injury (Table 3). The thresholds which each marine mammal and pinniped hearing group may experience sound-related injury are presented in Table 6. These thresholds are derived from measurements of marine mammal hearing, using weighting functions that account for the peak hearing abilities of each group (NOAA, 2018).

Table 6 Criteria Considered in this Assessment for the Onset of Injury (PTS) in Marine Mammals from Impulsive Sound (NMFS, 2018; Southall *et al*., 2019)

Marine Mammal Hearing Group	Impulsive Sound		Non-Impulsive Sound
	Peak Pressure (dB re 1 µPa)	Cumulative SEL (dB re 1 µPa²s)	Cumulative SEL (dB re 1 µPa²s)
Low-frequency (LF) cetaceans	219	183	199
High-frequency (HF) cetaceans	230	185	198
Very high-frequency (VHF) cetaceans	202	155	173
Phocid pinnipeds (underwater)	218	185	201

3.3.2. Disturbance

To evaluate the possibility of a disturbance offence (as defined in Section 1.3.1) from the proposed surveys, it is essential to assess whether the survey activities could cause a non-trivial disturbance based on the sensitivities of the species present and whether the number of individuals affected could lead to population-level consequences. If there is a potential for disturbing an individual animal, an EPS Licence must be obtained to avoid committing an offence. However, when issuing an EPS Licence, MD-LOT must consider whether the FCS of any species will be impacted.

The impacts of the proposed activities on the FCS of all protected species must be considered in the context of regulations 39(1) and 39(2) of the Habitats Regulations.

In accordance with recent stakeholder feedback on EPS licence applications, the potential range of disturbance for UHRS and SBP has conservatively been estimated using the 5 km Effective Deterrence Range (EDR). The 5 km EDR is recommended to be used in the assessment of underwater sound disturbance impacts to harbour porpoise associated with geophysical surveys (Joint Nature Conservation Committee (JNCC), 2020). It is noted that this estimate is based on generalised assumptions of the equipment specifications and on equipment which emits frequencies that have the potential to disturb harbour porpoise. Using this 5 km EDR for all marine mammal species is highly precautionary.

It is not considered appropriate to use the 5 km EDR for USBL, given the low source level associated with this piece of equipment (<207 dB), compared to source levels for SBP and UHRS. For assessing potential marine mammal disturbance from the operation of USBL, auditory thresholds for disturbance as defined by the National Marine Fisheries Service (NMFS, 2014), along with behavioural response criteria from Southall *et al.* (2007), have been adopted. These thresholds (provided in SPL_{rms}) and the behavioural response severity rating are detailed in Table 7.

Table 7 Disturbance Threshold Criteria for Impulsive Sounds (Southall *et al.*, 2007; NMFS, 2014)

Behavioural Effect	Threshold Criteria SPL_{RMS} (dB re 1 µPa)
Potential strong behavioural reaction (6 or more on the severity scale)	160

3.4. Sound-Related Impacts to EPS and Pinnipeds

3.4.1. Sound Modelling Approach

3.4.1.1. Geophysical Survey Equipment

Underwater modelling has been undertaking using Xodus' SubsoniX sound model which was developed specifically for assessing environmental impacts as a result of underwater sound emissions. The SubsoniX model approach is based on an extended version of the semi-empirical model developed by Marsh-Schulkin (Marsh and Schulkin, 1962). The sound propagation model uses several concepts including:

- Refractive cycle, or skip distance;
- Geometric divergence;
- Deflection of energy into the bottom at high angles by scattering from the sea surface;
- A simplified Rayleigh two-fluid model of the bottom for sand or mud sediments; and
- Absorption of sound energy by molecules in the water.

The following inputs are required to the model:

- Sound source level data;
- Discreet range (distance from source to receiver);
- Water column depth and sediment layer depth;
- Sediment type (sand/mud);
- Sea state; and

- Source directivity characteristics.

Standard assumptions are input into the model for a realistic worst-case assessment. The model is based on a combination of acoustic theory and empirical data from around 100,000 measurements and has been found to provide good predictions.

The duel-metric assessment approach disseminated in National Oceanic and Atmospheric Administration (NOAA, 2018) has been used to estimate injury impact range from: (1) the peak SPL; and (2) the weighted cumulative SEL criteria. 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 detailed in Table 5, empirically-based weighting functions (NOAA, 2018; Southall et al., 2019) have been applied to the modelling outputs to account for peak hearing sensitivity for the respective marine mammal hearing groups.

The following assumptions have been applied to the models:

- Maximum reported SPLs for all equipment have been used;
- Maximum pulse length and minimum turn around has been used where provided;
- Where data is unavailable, the time between pulses has been estimated as 1.5 times the pulse length;
- Vessels are moving at slow speeds; and
- Survey equipment likely to be used in the nearshore shallow water environment (i.e. <10 m) will operate at higher frequencies to provide better resolution and will have a lower SPL, and so does not constitute a worst-case scenario.

The directivity 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 (Richardson *et al*., 1995). 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 and dip angle. Directivity corrections have been applied to the modelling outputs under the assumption that the animal is directly in-line with the vessel.

As detailed in Section 3.3.2, the disturbance threshold uses the SPL_{rms} metric, and hence needs to be evaluated against equipment source levels in SPL_{rms}. It is important to note that the root mean square (rms) value associated with the SPL_{rms} depends upon the length of the integration window used. Using a longer duration integration window results in a lower rms than produced by a shorter integration window.

An acoustic phenomenon results from the elongation of the waveform with distance from the source due to a combination of dispersion and multiple reflections. Measurements presented by Breitzke *et al.,* (2008) indicate elongation of the T90 window up to approximately 800 m at 1 km. This temporal “smearing” reduces the rms amplitude with distance by elongating the rms window and has been included within the disturbance modelling scenarios. Since the auditory organs of most marine mammals integrate low frequency sounds over an acoustic window of around 200 ms (Madsen *et al*., 2006 and references therein), this duration was used as a maximum integration window for the received SPL_{rms}.

3.4.1.2. Percussive Boreholes

Huang *et al.* (2023) characterised the source and sound propagation characterisations associated with Offshore Exploratory Drilling (OED) at the Xiamen port in China. The categories of sound outlined by Huang *et al.* (2023) include:

- Hammering sound (hammering down of casings, which were 180-mm diameter steel pipes);

- Vibrating sound (vibration of casings that had been hammered down); and
- Drilling sound (generated during the borehole drilling process).

In-field sound recordings were taken at 6 m, 18 m and 280 m from the source at a 3 m water depth during periods when hammering, vibrating and drilling of borehole casings was being undertaken. The potential for injury to marine mammals were determined using the sound exposure criteria developed by Southall *et al.* (2019), as outlined in Section 3.3.1. Disturbance impacts were determined by calculating the distance over which the sound from the source attenuated to background levels (Huang *et al*. 2023).

The assessment of the potential risk of injury and disturbance to EPS from percussive borehole survey activities are informed by the in-field measurements and analysis by Huang *et al.* (2023). For injury impacts, Huang *et al* (2023) derived weighted cumulative SEL (SEL_{cum}), using a one second interval.

For disturbance impacts, the distance over which the sound from the source attenuated to background levels was determined by calculating the transmission loss from the source and determining when the received sound levels would be equal to background sound (measured as 117.5 – 126.8 SPL_{rms}).

3.4.2. Injury Impacts

3.4.2.1. Geophysical Survey Equipment

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 6.

Modelling of ranges at which injury impacts are likely to result from deployment of geophysical survey equipment has been undertaken, as described in Section 3.3.1 (Table 8). Example equipment has been selected to exemplify the realistic worst-case scenario for UHRS, SBP and USBL, including the maximum SPLs across source frequencies meant to encapsulate the hearing abilities of all representative hearing groups. Impacts from sound sources which are strictly behavioural in nature (i.e. disturbance impacts) are covered in Section 3.3.2.

All of the survey technologies modelled have the potential to cause injury to EPS and pinnipeds (Table 8). As such, the survey activities may be potentially injurious to EPS species without appropriate mitigations.

Across modelling scenarios and metrics, the injury ranges were generally highest for the Very High-Frequency (VHF) hearing group (Table 8), which is represented by the harbour porpoise in UK waters. Conversely, HF cetaceans seemed to constitute the hearing group with the lowest potential impact ranges for the peak SPL. Additionally, for both the SBP and USBL equipment, LF cetaceans largely displayed the lowest impact ranges for the cumulative SEL metrics, whereas HF cetaceans demonstrated the lowest impact ranges for both SEL metrics when considering use of the low frequency UHRS system (Table 8).

Higher frequency sounds attenuate more quickly than lower frequency sounds such that an animal would need to be much closer to the sound source for it to cause injury. For this reason, injury ranges were in the order of metres to tens of metres for the SBP operating at 100 kHz.

The deployment of USBL in 100 m depths has a potential range of impact to a maximum of 43 m for VHFs, when considering cumulative SEL metric. However, in order for the cumulative SEL threshold to be exceeded, an animal would have to remain within 43 m of the source for a sustained period. The likelihood of a cetacean remaining this close to operational survey equipment is extremely low when considering that the source is deployed from a moving vessel travelling (i.e. 1- 4 knots) and, in some cases, is being towed at depth (e.g., a USBL may be mounted on an ROV within a few metres of the seabed). Whilst USBL may be deployed from a stationary vessel during particular activities (e.g., geotechnical sampling), these are anticipated to be limited in duration. As such, a realistic risk of injury is not expected from the use of USBL, and no marine mammal mitigation is proposed for USBL operations.

Table 8 Sound Modelling Results for Injury Impacts from Impulsive Sound Sources (N/E = no exceedance of thresholds)

Activity	Frequency (kHz)	SPL_{peak} (dB re 1μPa)	Depth (m)[3]	Injury Range (m)											
				Weighted Cumulative SEL (Static Mammals)				Weighted Cumulative SEL (Moving Mammals)				Unweighted SPL_{peak}			
				VHF	HF	LF	PW	VHF	HF	LF	PW	VHF	HF	LF	PW
USBL	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	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
	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
	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
UHRS[4]	0.1	250	100	10	N/E	44	41	2	N/E	44	13	511	17	63	70
		250	10	3	N/E	4	4	2	NE	4	4	559	19	71	80
	6	250	100	44	44	44	44	44	44	44	44	381	14	49	54
		250	10	4	4	4	4	4	4	4	4	412	15	55	62

[3] These depths have been identified as representative of the nearshore and offshore depths in which surveys are likely to occur across the survey corridor, based on available bathymetry data.

[4] Sound modelling for UHRS undertaken based on a ping range of 0.0003 – 0.0015 second ping length, with 0.0015s results presented to represent the realistic worst-case scenario.

The greatest injury ranges to EPS during shallow water operations (i.e., 10 m) came from both the UHRS operating at 0.1 kHz and SBP operating at 4 kHz, 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. The deployment of the UHRS survey equipment in 10 m depths has a potential range of impact to a maximum of 559 m for VHF cetaceans. SBP operating at 4 kHz in shallow waters demonstrated a maximum impact range of 445 m for VHF cetaceans.

Whilst deployment of a very low frequency UHRS system and a low frequency SBP in nearshore waters constitutes a worst-case situation of the potential injury range attributable to the survey techniques, these scenarios are highly unlikely. Geophysical survey technologies generally employ higher frequency sounds in shallow waters where sound absorption losses during transmission are much lower (Applied Acoustics, 2022). 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 the equipment, 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 40° angle from the source (the slant height of the conical sound source) to maximise penetration and optimise the resultant imagery (BOEM, 2016). Animals would need to be at the seabed below the sound source to experience the full sound levels behind the modelled impact ranges.

The greatest potential injury range for EPS in deeper waters (i.e. 100m) is identified from the operation of the low frequency UHRS (0.1 kHz), where the potential impact range to VHF cetaceans is modelled at 511 m when considering the SPL_{peak} metric. These impact ranges for the UHRS were slightly reduced, when considering the operation of the equipment within the higher frequency scenario (6 kHz).

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 area have been shown to be several meters per second (e.g., cruising minke whales swim speed is 3.25 ms^{-1} and harbour porpoise swim speeds are up to 4.3 ms^{-1}) (Blix and Folkow, 1995; Otani *et al*., 2000). Further, NatureScot (2016) has provided standard values for mean swimming speeds of various marine mammal species likely to occur in the survey corridor, 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 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.

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 and UHRS operations, marine mammal mitigation will be implemented if SBP and UHRS are 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 or UHRS surveys (JNCC, 2017).

However, owing to the results of the modelling for the UHRS operating at 0.1 kHz, whereby a maximum injury range of 559 m to VHF cetaceans has been modelled for shallow waters, it is proposed that the marine mammal mitigation zone is extended to 600 m from the standard 500 m radius specified by the JNCC (2017) for UHRS at 0.1 kHz. This notwithstanding, UHRS at 6kHz and SBP equipment will only require a 500 m mitigation zone.

In consideration of the relevant mitigation measures for SBP and UHRS, none of the modelled scenarios indicate any injury events are likely to exceed the 500 m mitigation zone (600 m for UHRS at 0.1 kHz). As EPS and other marine mammal species would need to come within the mitigation zone, and likely follow, the moving vessel or vehicles 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 impair the ability of an animal to survive or reproduce or result in any significant impacts on the FCS of any EPS.

3.4.2.2. Percussive Boreholes

Table 9 presents a summary of the results presented in Huang *et al.* (2023), including whether the injury thresholds for marine mammals would be exceeded at 6, 18 and 280 m from the source.

Table 9 Sound Modelling Results from Huang *et al.* (2023) for Injury Impacts from Percussive Boreholes (N/E No Exceedance of Thresholds)

Activity	Frequency (kHz)	SPL_{peak} (dB re 1µPa)	Weighted Cumulative SEL (Static Animals)											
			6 m from the Source				18 m from the Source				280 m from the Source			
			VHF	HF	LF	PW	VHF	HF	LF	PW	VHF	HF	LF	PW
Hammering	1 – 64[5]	206 - 216	181.4	N/E	194.5	193.7	173.1	N/E	N/E	186.8	N/E	N/E	N/E	N/E
Vibrating	0.041[6]	162 - 172	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E
Drilling	0.0456	162 - 180	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E

The only activity with the potential to injure cetaceans and pinnipeds is hammering. VHF cetaceans and PW have the highest injury ranges, with the potential for injury to occur out to 18 m from the source. HF cetaceans have the lowest potential impact ranges, with no injury predicted at 6 m from the source.

The maximum predicted injury ranges from percussive boreholes are not presented in Huang *et al.* (2023). However, for all marine mammal hearing groups, no injury is predicted to occur at 280 m from the source. Furthermore, the Southall *et al*. (2019) injury thresholds for VHF and PW hearing groups were only marginally exceeded at 18 m from the source, and therefore, it would be expected that received sound levels would attenuate to below injurious levels somewhere between 18 and 280 m from the source. As

[5] Dominant frequency below 10 kHz.

[6] Dominant frequency.

described above for geophysical survey equipment, for this auditory injury to occur, an animal would have to remain within close proximity (<280 m) of the source over a sustained period of time, which is highly unlikely to occur. Therefore, a realistic risk of injury is not expected from percussive boreholes, and no marine mammal mitigation is proposed for these operations.

3.4.3. Disturbance Impacts

3.4.3.1. Geophysical Survey Equipment

In addition to physical injury, sound emissions have the potential to affect the behaviour of cetaceans and pinnipeds in the vicinity of the sound source. Significant or strong disturbance (see Section 3.3.2; 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.

As outlined in Section 3.3.2, a 5 km EDR has been used to estimate the range of disturbance associated with the operation of UHRS and SBP, whereas, disturbance from USBL has been estimated through a modelling approach using auditory thresholds for disturbance as defined by the National Marine Fisheries Service (NMFS, 2014), along with behavioural response criteria from Southall *et al.* (2007). The outputs of the sound modelling assessment against the disturbance thresholds are provided in Table 10.

Table 10 Sound Modelling Results for Disturbance Impacts from Impulsive Sound Sources

Activity	Frequency (kHz)	SPL_{rms} (dB re 1µPa)	Depth (m)	Range of Behavioural Change (m)
USBL*	19.5 – 33.5	190	100	63
			10	64
SBP**	0.5 – 12	227	All	5,000
	4	230	All	
	100	230	All	
UHRS**	0.1	247	All	
	6	247	All	

** Estimated through a modelling approach using auditory thresholds for disturbance as defined by the National Marine Fisheries Service (NMFS, 2014), along with behavioural response criteria from Southall et al. (2007).*

*** Estimated using the 5 km EDR for geophysical surveys (JNCC, 2020).*

SBP, USBL and UHRS survey activities have the potential to generate a strong disturbance event (i.e. a disturbance offence) as described in Section 1.3.1. The potential for a disturbance offence to result from these types of technology varies between activity type, though, the predicted disturbance range is expected to be much greater for the low frequency sound sources which travel further within the marine environment. The sounds emitted by the SBP (operating at 0.5 – 12 kHz or at 4 kHz) and UHRS (operating between 0.1 – 6 kHz) form the lower frequency sounds and it has conservatively been estimated that disturbance could occur out to 5 km, based on the EDR presented in JNCC (2020). The operation of USBL will be at a higher frequency and lower source level and the disturbance range is estimated out to 64 m for this equipment (Table 10).

The number of individuals which may experience disturbance from the worst-case scenario for each activity type has been calculated in Table 11 below, based on the population parameters supplied in Table 4 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 11 Number of Cetaceans which May Experience a Disturbance Offence from Impulsive Survey Activities Based on Known Population Parameters of the Most Frequently Occurring Species

Species Name	Number of Individuals Which May Incur a Strong Disturbance		Proportion Of the MU Potentially Affected by Project Activities
	USBL* 19.5 – 33.5 kHz ($0.02\ km^2$)	UHRS and SBP** UHRS: 0.1 – 6 kHz SBP: 0.5 – 12 kHz (chirp); 4 kHz (pinger); 100 kHz (pinger) ($78.54\ km^2$)	
Harbour porpoise	0.01	30.72	0.11 %
Bottlenose dolphin	0.01	26.87	59.71%
Risso's Dolphin	<0.01	1.92	0.02%
Minke whale	<0.01	2.77	0.01%
Common dolphin	0.02	72.78	0.07%
White-beaked dolphin	<0.01	10.84	0.02%
White-sided dolphin	<0.01	2.19	0.01%

** Estimated through a modelling approach using auditory thresholds for disturbance as defined by the National Marine Fisheries Service (NMFS, 2014), along with behavioural response criteria from Southall et al. (2007).*

*** Estimated using the 5 km EDR for geophysical surveys (JNCC, 2020).*

The source levels associated with the example survey equipment have the potential to elicit a strong behavioural response in EPS which could be classed as a disturbance offence as defined under the Habitats Regulations. However, for most species, the proposed survey activities will impact 0.11% or less of the relevant biogeographic populations by sound-related disturbance with the exception of bottlenose dolphins. Assuming a 5 km disturbance range for UHRS and SBP, up to 26.87 individuals could be disturbed, representing 59.7% of the Central West Scotland and Hebrides management unit. However, as noted in Section 3.1, the survey corridor lies outwith the areas expected to support the highest density of bottlenose dolphins in the region (in the Sound of Barra). Therefore, it is considered highly unlikely that the survey activities would impact this proportion of the Central West Scotland and Hebrides management unit, and in reality, the proportion affected would be much lower.

Furthermore, with regards to USBL, the number of animals within the disturbance range at any one time is predicted to be ≤0.02 individuals (Table 11). This means that on average, there will be no marine mammals within the disturbance range for 99.98% of USBL operations, making potential disturbance impacts at the population level arising from this survey equipment negligible. As such, the use of USBL does not have the potential to result in an EPS disturbance offence under the Habitats Regulations. Therefore, an EPS licence for disturbance will not be required for the use of USBL.

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), which is highly unlikely.

The survey activities are anticipated to be completed over approximately 68 days throughout the survey period. This timeframe captures both nearshore and offshore survey campaigns, and within these campaigns there will be periods of inactivity, for example 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 the UHRS or 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 predicted 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.

It is possible that a small number of animals may experience some level of disturbance for the short period that they encounter the proposed survey activities. As such, an EPS Licence will be required for disturbance of cetaceans potentially resulting from UHRS and SBP survey activities, in accordance with the Habitat Regulations.

3.4.3.2. Percussive Boreholes

Huang *et al.* (2023) estimated that hammering sound could be detected out to 1.9 km from the source and that drilling sound could be detected out to 170 m from the source. Vibrating sound was only predicted to be detectable to marine mammals within very close proximity of the source (i.e. within 40 m). It is important to note that the approach to assessing the potential for disturbance by Huang *et al.* (2023) does not consider the threshold criteria presented in Section 3.3.2, and instead is representative of whether the sound is detectable above background levels. As per the criteria set out in Section 3.3.2, disturbance of EPS in the context of the Habitats Regulations is considered to represent non-trivial disturbance (i.e. strong behavioural reaction). Therefore, the 1.9 km disturbance radius presented in Huang *et al*. (2023) likely overestimates the range over which non-trivial disturbance impacts may occur. Overall, the disturbance from the percussive boreholes is expected to disturb a limited number of individuals within close proximity to the survey activities.

Nevertheless, it is possible that a small number of animals may experience some level of disturbance for the short period that they encounter the proposed survey activities. As such, an EPS Licence will be required for disturbance of cetaceans potentially resulting from percussive borehole survey activities, in accordance with the Habitat Regulations.

3.5. 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 are protected in the UK waters principally under Schedule 5 of the WCA Act 1981 and under the Nature Conservation (Scotland) Act 2004. 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). There have been incidental sightings of basking sharks recorded around Stornoway and Ullapool (Marine Scotland, 2023).

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. However, this may or may not be transferable to basking sharks (Macleod *et al.,* 2011). As the 20 Hz – 1 kHz range 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, potential underwater sound emission impacts on basking sharks are screened out of further assessment, and a basking shark derogation licence under the WCA will not be sought in this regard.

Although a basking shark derogation licence will not be required in relation to impacts associated with underwater sound emissions, the presence of survey vessels also poses a threat to this slow-moving species. The potential risks to basking sharks associated with vessel presence increases with vessel speed, with collisions with basking shark potentially occurring at higher speeds. Given the survey vessels will be moving slowly during the survey activities (≤4 kt), injuries to basking shark resulting from collisions with basking shark are not anticipated. SSEN Transmission will further reduce potential impacts on basking sharks resulting from the presence of survey vessels, through the adoption of appropriate mitigation measures and by following the Basking Shark Code of Conduct (Shark Trust, 2024) (as outlined in Section 5). Basking sharks in this area are presumed to be well accustomed to vessel activity, and the vessels used for the proposed survey works will not constitute a discernible change from baseline conditions. However, as disturbance to basking sharks due to the presence of survey vessels remains a possibility, an application for a basking shark derogation licence under the Wildlife and Countryside Act 1981 (as amended) will be submitted.

3.6. Cumulative Effects

There are no planned projects directly overlapping the survey corridor that could result in cumulative effects to EPS and other protected species. There are also three offshore windfarms in the pre-planning phase to the north of the Isle of Lewis, Spiorad na Mara, the Talisk Offshore Wind Project and the Havbredey Offshore Wind Farm. In addition, there is also the development of the Stornoway Port extension (Stornoway

Deep Water Terminal and Stornoway Deep South project) which could involve impact piling. There are also existing BT assets in close proximity to the survey corridor, including the BT HIE telecommunication cable which follows a similar route as the survey corridor across the Minch between Stornoway to Ullapool, and two BT cables which run north-south through Little Loch Broom. Operational surveys of these assets could act cumulatively with the Project surveys.

It is acknowledged that there is the potential for cumulative effects to arise if pre-construction surveys, construction works and operational surveys for nearby projects were to coincide with the proposed survey activities. However, as described in the sections above, disturbance to EPS from the Project's survey activities is expected to be both spatially and temporally limited with only a very low number of individuals being disturbed. Therefore, significant cumulative effects on EPS or other protected species are not expected.

3.7. Conclusions

It is anticipated that 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 resulting from the use of SBP, UHRS and percussive boreholes, therefore SSEN Transmission will apply for an EPS Licence in respect to disturbance from these activities. 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.

The use of USBL will not result in any injury risk, and the extremely limited disturbance ranges result in a prediction of ≤0.02 individuals of any EPS species being exposed to disturbance at any given time. Combined with the transient nature of the survey activities mean that an EPS disturbance offence (as defined by the Habitats Regulations) is not anticipated to result from the use of use of USBL, and hence an EPS licence will not be required for this equipment.

Although unlikely, there remains a possibility for disturbance to basking sharks in relation to potential vessel collision or disturbance. Therefore, an application for a Basking Shark Derogation Licence under the Wildlife and Countryside Act 1981 (as amended) will be submitted.

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

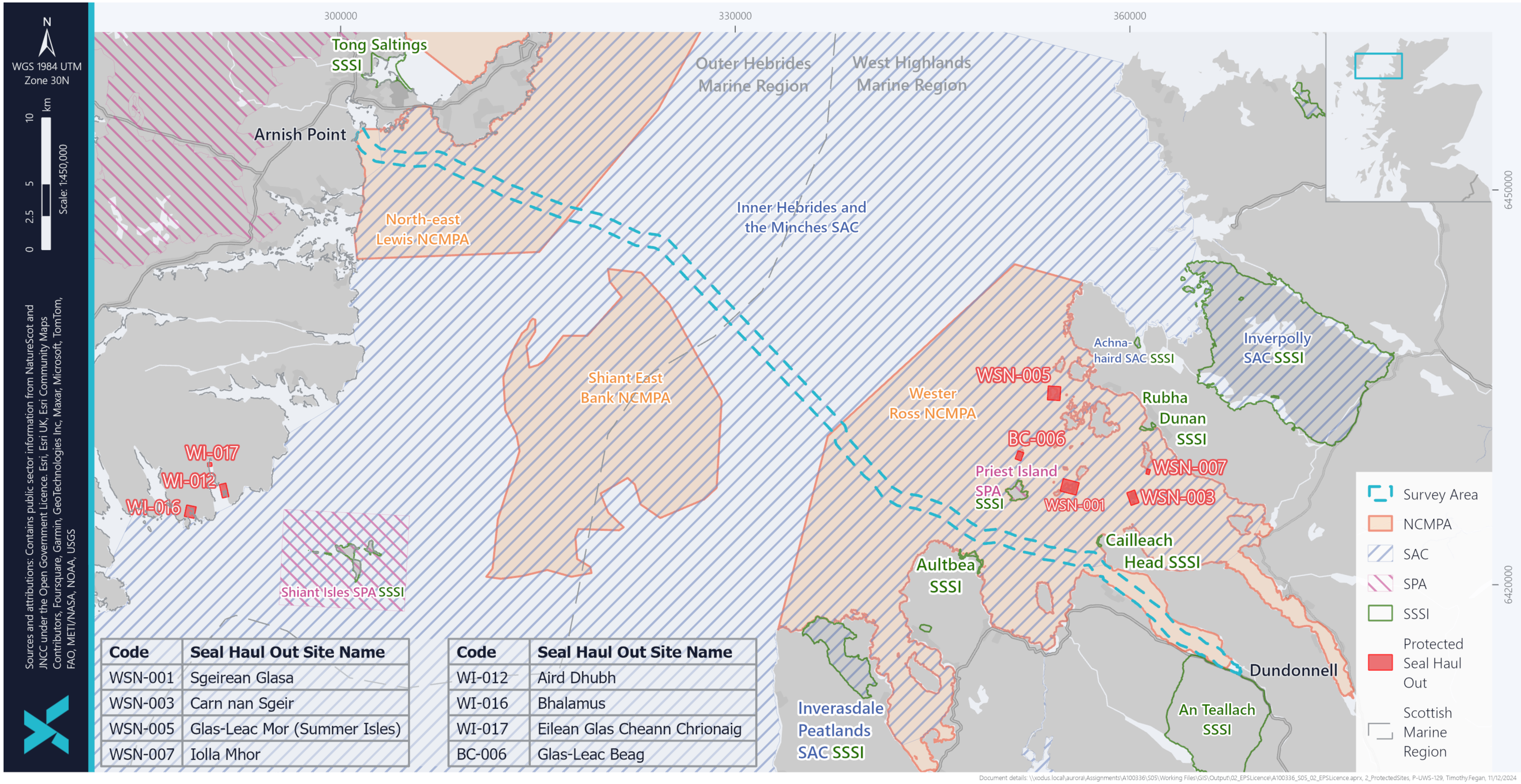
4.1. Selection of Protected Sites for Assessment

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 criteria used to select the protected sites for assessment is detailed in Section 1.4.4.

The protected sites located in the vicinity of the survey corridor which have the potential to be impacted by survey activities according to the selection criteria are outlined in Table 12 and shown in Figure 2. Sites of Special Scientific Interest (SSSIs) have only been screened into the assessment where there is the potential for ecological connectivity with the survey activities (i.e. sites designated for coastal and terrestrial activities that will not be affected by the survey activities have not been considered). The only relevant SSSI identified is the Priest Island SSSI. However, as this SSSI (protected for maritime cliff and storm petrel (*Hydrobates pelagicus*) is wholly contained within the Priest Island (Summer Isles) SPA, a specific assessment is not provided for this SSSI, as the SPA assessment is considered sufficient.

For each protected site that has the potential to be affected by the proposed surveys, mitigation measures have been considered based upon site-specific protected features and these are also included within Table 12. Details of the mitigation measures are provided in Section 5.

It should be noted that some of the mitigation measures included in Section 5 may not be listed in Table 12, if they are not related to protecting a relevant qualifying feature of those sites. However, all mitigation measures in Section 5 will be applied to all activities, regardless of proximity to a protected site.



Code	Seal Haul Out Site Name
WSN-001	Sgeirean Glasa
WSN-003	Carn nan Sgeir
WSN-005	Glas-Leac Mor (Summer Isles)
WSN-007	Iolla Mhor

Code	Seal Haul Out Site Name
WI-012	Aird Dhubh
WI-016	Bhalamus
WI-017	Eilean Glas Cheann Chrionaig
BC-006	Glas-Leac Beag

Figure 2 Protected sites in the vicinity of the survey corridor

Table 12 Protected Sites in the Vicinity of the Survey Corridor

Protected Site	Criteria For Potential Connectivity to Site	Distance From Nearest Part of Survey Corridor to Site (km)	Relevant Qualifying Features of Protected Site	Activity	Proposed Mitigation Measures	Potential For Likely Significant Effect (LSE)
Inner Hebrides and the Minches SAC	The protected site is located within 50 km of the survey corridor	0	• Harbour porpoise.	Vessel presence and geophysical survey activity.	M1, M2, M3, M4, M5	Yes
North-east Lewis NCMPA	The protected site is located within 50 km of the survey corridor for consideration of cetaceans, and overlaps with the survey corridor for consideration of benthic features	0	• Risso's dolphin; • Sandeels *Ammodytes marinus* / *Ammodytes tobianus*; and • Geological features including longitudinal bedform field, glaciated channels/troughs, landscape of areal glacial scour, and megascale glacial lineations.	Vessel presence and geophysical, geotechnical survey and benthic survey activities.	M1, M2, M3, M4, M5, M12, M13	Yes
Wester Ross NCMPA	The protected site overlaps with the survey corridor	0	• Northern feather star (*Leptometra celtica*) aggregations on mixed substrate; • Burrowed mud; • Circalittoral muddy sand communities; • Flame shell beds; • Kelp and seaweed communities on sublittoral sediment; • Mearl beds; • Mearl or coarse shell gravel with burrowing sea cucumbers; and • Geological features including banks of unknown substrate, glaciated channels/troughs, megascale glacial lineations, seabed fluid and gas seep (pockmarks), and submarine mass movement.	Vessel presence and geophysical, geotechnical survey and benthic survey activities.	M12, M13	Yes
Priest Island (Summer Isles) SPA / SSSI[7]	The protected site is located within 2 km of the survey corridor	2	• Breeding Storm petrel (*Hydrobates pelagicus*).	Vessel presence.	M6, M7	Yes

[7] The assessment provided within this section for the Priest Island (Summer Isles) SPA also applies to the SSSI, as these sites directly overlap. Therefore, a specific assessment for the Priest Island SSSI is not required.

4.2. Assessment of Impacts on Protected Sites

A summary is presented in the following subsections of the potential impacts to protected sites which will be further reduced though implementation of the specific species protection measures outlined in Section 5.

4.2.1. SACs and NCMPAs with Cetaceans as Qualifying Features

The Inner Hebrides and Minches SAC and North-east Lewis NCMPA are protected sites with cetacean qualifying features that overlap with the survey corridor (Figure 2).

The Inner Hebrides and Minches SAC is designated for harbour porpoise. An underwater sound impact assessment on protected species has been undertaken as detailed in Section 3.4. Harbour porpoise are a VHF cetacean with a maximum predicted injury range from the survey activities of up to 559 m, resulting from the operation of UHRS in shallow waters (Table 5). No injurious impacts are expected, once the mitigation measures set out in Section 5 are implemented. Thus, injury to harbour porpoise from survey activities will not occur when the mitigation is applied. Given that no injury impacts are expected, this site assessment focuses on disturbance. The potential for disturbance to cetaceans, including harbour porpoise, is described in Section 3.4.3. The number of harbour porpoise which may incur a strong disturbance was 30.72 individuals for UHRS and SBP. The Inner Hebrides and the Minches SAC population is estimated at between 3,030 and 9,128 individuals, and therefore, the survey works will disturb up to 0.0003% of the SAC population. When considering the small percentage of the SAC population potentially disturbed, the transient and temporary nature of the survey activities, and the mitigation measures presented in Section 5, no LSE is expected on the FCS of the harbour porpoise qualifying feature of the Inner Hebrides and the Minches SAC.

Additionally, there is overlap with the North-east Lewis NCMPA designated for Risso's dolphin. Based on the sound modelling results, and the SCANS-IV regional density of this species, there is potential for disturbance to 1.92 individuals for UHRS and SBP. It is estimated there is a minimum population of 117 Risso's dolphins present within the North-east Lewis NCMPA (Weir *et al*., 2019). Therefore, the survey activities could disturb up to 1.6% of the population of Risso's dolphins within the NCMPA. Due to the short duration and transient nature of the survey activities, combined with very small proportion of the NCMPA's Risso's dolphin population which would experience levels of sound that could cause disturbance, there will be no significant risk of hindering the achievements of the conservation objectives of this protected site with regards to impacts on Risso's dolphin.

4.2.2. SACs with Seals as Qualifying Features and Designated Seal Haul Outs

There are no SACs with harbour seal interests within 50 km of the survey corridor and no SACs designated for grey seal within 20 km of the survey corridor (Figure 2) (including proposed and candidate sites). Additionally, there are no designated seal haul-outs or grey seal breeding sites that overlap with or are located within 500 m of the survey corridor. The closest grey seal breeding site is located at Glas Leac Beag located 5.4 km north of the survey corridor, and the closest designated seal haul out site is Sgierean Glasa located 4.1 km north (Figure 2). Therefore, there is expected to be no LSE on the seal qualifying features of these SACs or any offence designated seal haul-out sites. SACs and NCMPAs with Otters as Qualifying Features

There are no SACs and NCMPAs (including proposed and candidate sites) with otter interests that overlap with or are located within 500 m of the survey corridor. The closest site designated for otter is the Inverpolly SAC which is located 14.6 km from the survey corridor. Otters may be disturbed by the presence of vessels but are not as sensitive to sound as cetaceans. Given the distance between the proposed survey activities and the Inverpolly SAC, it is highly unlikely that otters associated with this site will be encountered. As a result, there is expected to be no LSE on the otter qualifying feature of any SAC and no impact to any NCMPA designated for otters.

4.2.3. SPAs and NCMPAs with Birds as Qualifying Features

The Priest Island (Summer Isles) SPA is the only SPA or NCMPA (marine and terrestrial) with bird species as qualifying features that lies 2 km from the survey corridor (Figure 2). The Priest Island SPA supports one of the largest European storm petrel colonies in the UK (approximately 2.6% of the UK population), in addition to supporting small numbers of other breeding seabirds (NatureScot, 2023b). Storm petrels are present in breeding colonies from May to September, foraging offshore in the surrounding area during the day and then returning to shore to breed and at night (NatureScot, 2023b; RSPB, 2023). It is possible that the survey activities could overlap with the breeding season for storm petrels.

Vessel presence may directly disturb and/or displace birds. The presence of vessel lighting also has the potential to disorientate birds, leading to increased collision rates with vessels at night, which may be fatal (Rodriguez *et al.*, 2015). However, a single disturbance event is unlikely to have any immediate effect on the survival or breeding productivity of an individual bird, and this would only be expected with repeated disturbance over an extended period of time. Any disturbance from the survey activities would be temporary, transient and restricted to the immediate vicinity of the survey vessels, minimising any disturbance to birds associated with the breeding colonies of the Priest Island (Summer Isles) SPA. Additionally, the implementation of the mitigation measures described Section 5, will reduce any disturbance to storm petrels as a result of the survey activities. The survey vessels will be moving slowly, and this will limit any potential collision risk or disturbance. Therefore, no adverse effect on site integrity is expected with regards to impacts on the storm petrel qualifying feature of the Priest Island (Summer Isles) SPA.

4.2.4. SACs and NCMPAs with Benthic Qualifying Features

The Wester Ross NCMPA and North-east Lewis NCMPA are protected sites with benthic qualifying features that overlap with the survey corridor (Figure 2). The Wester Ross NCMPA is designated for a range of benthic qualifying features including benthic fauna (e.g., northern feather star aggregations), benthic habitats, and geological features as described in Table 12. The North-east Lewis NCMPA is designated for geological features and sandeel which are supported by the sandy substrate present within the NCMPA. The geophysical survey activities are not likely to have a significant effect on the benthic species, habitats, or geological features and therefore will not result in an adverse effect to the conservation status of the NCMPAs.

The geotechnical and benthic survey activities have the potential to affect the benthic and geological features present at these sites, including from offshore borehole drilling (including presence of JUVs), vibrocoring, PCPT, and grab sampling. However, for sampling activities, there will be a limited number of samples taken, and the sample size will be very limited (< 1 m^3 per sample) resulting in a limited footprint in the context of the wider habitat availability. Furthermore, as outlined in Section 5, appropriate mitigations will be in place to minimise the potential for disturbance to sensitive benthic or geodiversity features, including protected features of the Wester Ross NCMPA and North-east Lewis NCMPA.

The exact details of the JUVs are not yet known, however, the seabed disturbance associated with the presence of any spud can depressions is anticipated to have a small spatial footprint. Furthermore, these activities will be limited to nearshore and close to the landfall zones with a very limited overlap with the sites' qualifying features expected.

Overall, it is concluded that the survey activities will not pose a significant risk of achieving the conservation objectives of these NCMPAs.

4.3. In-Combination Effects

As described in Section 3.6, there are assets adjacent to the survey corridor which could potentially result in in-combination effects to the qualifying features of the protected sites identified above. However, any disturbance to the qualifying features of the protected sites listed in Table 12, is anticipated to be extremely spatially and temporally limited. It is not expected that these survey activities could result in a significant increase in the potential for LSEs or adverse effects on site integrity on protected sites, in addition to any impacts from other projects, plans and activities.

4.4. Conclusion

The following protected sites were identified as being potentially impacted by the survey activities, based on the criteria set out in Section 1.4.4, as outlined in Table 12:

- Inner Hebrides and Minches SAC (harbour porpoise);
- North-east Lewis NCMPA (Risso's dolphin, sandeel and geological features);
- Priest Island (Summer Isles) SPA (European storm petrel – breeding); and
- Wester Ross NCMPA (benthic species and habitats and geological features).

There will be no injurious impacts to harbour porpoise or Risso's dolphin associated with underwater sound as discussed in Section 3.4.2, and disturbance will be minimal given the marine mammal mitigation measures in place (Section 5). Thus, any impacts to harbour porpoise and Risso's dolphin from the survey activities will not result in an adverse effect on site integrity to the Inner Hebrides and the Minches SAC and will not pose a significant risk of hindering the achievement of the conservation objectives of the North-east Lewis NCMPA.

The assessment found that there are no SACs with seal qualifying features or designated seal haul-outs and grey seal breeding sites, and no SACs or NCMPAs with otter qualifying features located within the distance specified for potential impact (see Section 1.4.4). Therefore, there will be no LSE on any SACs with seal features, no LSE on any SACs designated for otter features and no risk of significantly hindering the achievement of conservation objectives of NCMPAs designated for otter features.

The seabird mitigation measures (Section 5.2) will be in place for any storm petrels, seabirds, or terrestrial birds present within the survey corridor during survey activities. Any disturbance to birds will be localised and temporary, and therefore, the survey activities will not result in an adverse effect on site integrity for the Priest Island (Summer Isles) SPA.

Finally, given the proposed mitigation, very small volumes of sediment to be extracted, and the highly localised seabed footprints associated with geotechnical and benthic survey activities, no adverse effects on the benthic and geological features of the Wester Ross NCMPA and North-east Lewis NCMPA are anticipated. Furthermore, there will be no significant risk of hindering the achievement of the conservation objectives of these NCMPAs.

Overall, due to the temporary and localised nature of the proposed activities within the overall survey window, no significant impact is anticipated on the conservation objectives of any protected site, with no potential for significant cumulative effects expected. The proposed survey operations are required to facilitate the progression of the development of the Project. Hence, the survey activities constitute work of an overriding public need whilst presenting a trivial and temporary disturbance in a limited area.

5. Species Protection Measures

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 works. Species and task specific mitigation is provided below; however, the following measures will be implemented during all survey works:

- All vessels will adhere to the provisions of the Scottish Marine Wildlife Watching Code (NatureScot, 2017a), Guide to Best Practice for Watching Marine Wildlife (NatureScot, 2017b) and Basking Shark Code of Conduct (Shark Trust, 2024); 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.

5.1. Marine Mammals

A Marine Mammal Protection Plan (MMPP) will be prepared in order to reduce risk of injury and disturbance to marine mammals resulting from SBP and UHRS survey operations, this will be aligned to JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017). It is noted that this equipment is not capable of performing a soft-start, and hence this procedure is not included. The key components of the MMPP for SBP and UHRS include:

- Deployment of an MMO to monitor for the presence of cetaceans and seals, prior to the commencement of SBP and UHRS operations;
- For SBP and UHRS 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 a Passive Acoustic Monitoring (PAM) system to detect for the presence of vocalising cetaceans that cannot be detected by the MMO;
- 500 m mitigation zone for cetaceans. If UHRS at 0.1 kHz is operated this will be increased to 600 m;
- The mitigation zone for seals will be reduced to 200 m in the event of a need to avoid critical delay to the project. MD-LOT will be notified upon any reduction in mitigation zone;
- If the SBP or UHRS is deployed on an uncrewed surface vessel or other autonomous vehicle, the mitigation measures outlined below will be conducted from a support vessel or suitable vantage point on land; and
- Reporting of survey activities and marine mammal sightings.

5.1.1. M1 – Marine Mammal Observer (MMO)

There will be MMO coverage for the duration of the UHRS and 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 will 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.

5.1.2. M2 – Marine Mammal Monitoring

During daylight hours the MMO(s) will carry out visual observations to monitor for the presence of cetaceans and seals before the UHRS and SBP is activated and will recommend delays in the commencement of the operation should any cetaceans or seals be detected within the 500 m mitigation zone. If UHRS is being operated at 0.1 kHz, this mitigation zone will be increased to 600 m.

The mitigation zone for seals may be reduced to 200 m in the event of a need to avoid critical delay to the project, subject to agreement with MD-LOT.

If the SBP or UHRS is deployed on a ROV, USV or AUV, this will be the centre of the mitigation zone, and not the observation vessel. Should any cetaceans or seals be detected within the mitigation zone prior to the commencement of SBP or UHRS operations (or after breaks in SBP or UHRS survey activity of more than 10 minutes), operations will be delayed until their passage, or the transit of the vessel, results in the cetaceans or seals being outwith the mitigation zone. In both 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 SBP or UHRS operations.

5.1.3. M3 – Passive Acoustic Monitoring (PAM)

If UHRS and 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 marine mammal vocalisations (e.g. PAMGuard or equivalent).

5.1.4. 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 UHRS and SBP operations. This will involve a visual (during daylight hours) or PAM watch (during poor visibility or at night) to determine if any cetaceans or seals are within the monitoring zone, as defined in Section 5.1.2.

5.1.5. M5 – Reporting

During survey campaigns involving UHRS and SBP operations, all recordings of cetaceans and seals will be made using JNCC Standard Forms. At the end of the operations, a monitoring report detailing the cetaceans recorded, methods used to detect them, and details of any problems encountered will be submitted to MD-LOT. The report will also include feedback on how successful the mitigation measures were. This reporting requirement will be communicated to the MMOs at project start up meetings and at crew change.

5.2. Seabirds

5.2.1. M6 – Rafting Seabirds

The survey vessels will be moving at a speed of 4-8 knots during survey operations, to allow any rafting seabirds time to disperse before the vessel arrives. When not on survey effort, vessels will avoid bird rafts where operationally possible, and safe to do so.

5.2.2. M7 – Light Disturbance

When within 2 km of an SPA and where there is potential for 24-hour working, the following measures will be implemented to minimise the potential impacts to birds:

- Lighting on-board the survey vessel(s) will be kept to the minimum level required to ensure safe operations; and
- Lights will be directed or shielded to prevent upward illumination and minimise disturbance; and
- Blackout blinds and/or curtains will be used where possible when working in the vicinity of marine SPAs.

5.3. Basking Sharks

5.3.1. M8 – Basking Shark Monitoring

As outlined in Section 5.1.1, there will be MMO coverage for the duration of the SBP and UHRS 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 5.1.2). Should any basking sharks be detected within 500 m of the vessel prior to the commencement of SBP or UHRS 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. M9 – Basking Shark Mitigation Zone

During UHRS and SBP surveys, 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 survey vessel. 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.

5.4. Otters

5.4.1. M10 – Otter Monitoring

There will be MMO coverage for the duration of the UHRS and SBP survey operations, with adequately trained and experienced MMO(s) working standard 12-hour shifts. The MMO will also monitor for the presence of otters (see also Section 5.1.2).

5.4.2. M11 – Otter Mitigation Zone

When conducting UHRS and SBP surveys, the MMO will monitor for the presence of otters in the water in addition to marine mammals and basking sharks and delay the start of the survey if any are seen within 200 m of the survey vessel.

5.5. Benthic

5.5.1. M12 – Avoidance of Sensitive Benthic Features (Where Practical) for Geotechnical Survey Activities

For all geotechnical survey activities, known sensitive seabed features of benthic habitats will be avoided where practical, including protected features of relevant NCMPAs, informed by previous DDV and ROV inspection.

5.5.2. M13 – DDV / ROV Inspection Prior to Benthic Grab Sampling

DDV/ROV inspection will be conducted prior to benthic grab sampling. If any sensitive features and habitats are identified, these will be avoided. Seabed visual transects will instead be conducted at locations which are identified as unsuitable for grab sampling.

6. Conclusion

This EPS risk assessment has assessed the risk posed by the survey activities (including equipment calibration) associated with the Project to EPS, other protected species, and protected sites. This has included assessing the risk caused by sound emitted from survey vessels and the geophysical and geotechnical survey equipment, collision risk and disturbance to the following receptors:

- Otters;
- Cetaceans;
- Basking sharks;
- Seabirds;
- SACs with cetacean, benthic, seal and otter qualifying features;
- NCMPAs with cetacean, basking shark, benthic, bird and otter qualifying features;
- SPAs; and
- Designated seal haul-outs and seal breeding sites.

This assessment has concluded that the nature of the survey works, in combination with the proposed mitigation, means that no adverse impact through injury to EPS is anticipated, and an EPS licence is not required in this regard. However, the use of SBP and UHRS equipment as well as drilling of geotechnical boreholes may cause disturbance to cetaceans, and as such, an application for an EPS Licence for disturbance of EPS will be sought by SSEN Transmission. In addition, although unlikely, there remains a risk of disturbance to basking sharks resulting from vessel presence, and therefore a basking shark derogation licence will also be sought.

The survey corridor overlaps with several protected sites, including an SAC, and two NCMPAs, while an SPA is located within 2 km of the survey corridor. However, due to the temporary and localised nature of the survey activities, long-term 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 (see Section 5). Therefore, there will be no adverse effect on site integrity for any European site and the survey activities will not pose a significant risk of hindering the conservation objectives of any NCMPA.

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

7. References

Applied Acoustics (2022). Understanding Marine Sub-Bottom Profiling Technology. Available online at: https://www.oceansciencetechnology.com/feature/understanding-marine-sub-bottom-profiling-technology/ [Accessed 26/01/2025].

Department for Business, Energy and Industrial Strategy (BEIS) (2022). UK Offshore Energy Strategic Environmental Assessment 4 (OESEA4). Available online at: https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-4-oesea4 [Accessed 10/12/2024].

Blix, A.S. and Folkow, L. (1995). Daily energy requirements in free living minke whales. Acta Physiol. Scand. 153: 61-66. Available online at: https://doi.org/10.1111/j.1748-1716.1995.tb09834.x [Accessed 09/12/2024].

Breitzke, M., Boebel, O., El Naggar, S., Jokat, W. and Werner, B. (2008). Broad-band calibration of marine seismic sources used by R/V Polarstern for academic research in polar regions, Geophysical Journal International, 174: 505–524. Available online at: https://doi.org/10.1111/j.1365-246X.2008.03831.x [Accessed 09/12/2024].

Gilles, A, Authier, M, Ramirez-Martinez, NC, Araújo, H, Blanchard, A, Carlström, J, Eira, C, Dorémus, G, Fernández-Maldonado, C, Geelhoed, SCV, Kyhn, L, Laran, S, Nachtsheim, D, Panigada, S, Pigeault, R, Sequeira, M, Sveegaard, S, Taylor, NL, Owen, K, Saavedra, C, Vázquez-Bonales, JA, Unger, B, Hammond, PS (2023). Estimates of cetacean abundance in European Atlantic waters in summer 2022 from the SCANS-IV aerial and shipboard surveys. Final report published 29 September 2023. 64. Available online at: https://www.tiho-hannover.de/fileadmin/57_79_terr_aqua_Wildtierforschung/79_Buesum/downloads/Berichte/20230928_SCANS-IV_Report_FINAL.pdf [Accessed on 10/12/2024].

Hague, E. L., Sinclair, R.R. and Sparling, E. (2020). Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters. Scottish Marine and Freshwater Science Vol 11 No 12. Published by Marine Scotland Science. https://doi.org/10.7489/12330-1. Available online at: https://data.marine.gov.scot/dataset/regional-baselines-marine-mammal-knowledge-across-north-sea-and-atlantic-areas-scottish [Accessed 06/12/2024].

Hebridean Whale and Dolphin Trust (HWDT) (2018). Hebridean Marine Mammal Atlas. Part 1: Silurian, 15 years of marine mammal monitoring in the Hebrides. A Hebridean Whale and Dolphin Trust Report (HWDT), Scotland, UK. pp 60. Available online at: https://static1.squarespace.com/static/595bcd2e86e6c029dc28ac1d/t/641c5cd3eb3aa1122201b0dd/1679580397423/HWDT+Hebridean+Marine+Mammal+Atlas%2C+Part+1.pdf [Accessed 09/12/2024].

HWDT (2024). Bottlenose dolphins. Available online at: https://static1.squarespace.com/static/595bcd2e86e6c029dc28ac1d/t/641c5cd3eb3aa1122201b0dd/1679580397423/HWDT+Hebridean+Marine+Mammal+Atlas%2C+Part+1.pdf [Accessed 13/12/2024].

Huang, L.F., Xu, X.M., Yang, L.L., Huang, S.Q., Zhang, X.H. and Zhou, Y.L. (2023). Underwater noise characteristics of offshore exploratory drilling and its impact on marine mammals. Frontiers in Marine Science, 10, p.1097701.

Inter-Agency Marine Mammal Working Group (IAMMWG) (2022). Updated Abundance Estimates for Cetacean Management Units in UK Waters. Available online at: https://data.jncc.gov.uk/data/3a401204-aa46-43c8-85b8-5ae42cdd7ff3/jncc-report-680-revised-202203.pdf [Accessed 09/12/2024].

Joint Nature Conservation Committee (JNCC) (2017). JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys. August 2017. Available online at:

https://data.jncc.gov.uk/data/e2a46de5-43d4-43f0-b296-c62134397ce4/jncc-guidelines-seismicsurvey-aug2017-web.pdf [Accessed 09/12/2024].

JNCC (2020). Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Wales & Northern Ireland). Available online at: https://assets.publishing.service.gov.uk/media/5ed7ba3c86650c76ab17fcc5/SACNoiseGuidanceJune2020.pdf [Accessed 09/10/2024].

JNCC (2023). MPA Mapper. Available online at: https://jncc.gov.uk/mpa-mapper/ [Accessed 06/12/2024].

Macleod, K., Lacey, C., Quick, N., Hastie, G. and Wilson, J. (2011). Guidance on survey and monitoring in relation to marine renewables deployments in Scotland. Volume 2. Cetaceans and Basking Sharks. Unpublished draft report to Scottish Natural Heritage and Marine Scotland. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/SNH-2011-Volume-2.pdf [Accessed 09/12/2024].

Madsen, P.T., Johnson, M., Miller, P.J. O., Soto, N.A., Lynch, J. and Tyack, P.L. (2006). Quantitative measures of air-gun pulses recorded on sperm whales (*Physeter macrocephalus*) using acoustic tags during controlled exposure experiments. The Journal of the Acoustical Society of America, 120:2366. Available online at: https://doi.org/10.1121/1.2229287 [Accessed 09/12/2024].

Marine Scotland (2023). Marine Scotland - National Marine Plan Interactive (NMPi). Available online at: https://marinescotland.atkinsgeospatial.com/nmpi/ [Accessed 10/12/2024].

NatureScot. (2017a). Scottish Marine Wildlife Watching Code. Available from: https://www.nature.scot/doc/scottish-marine-wildlife-watching-code-smwwc-part-1 [Accessed 11/12/2024].

NatureScot. (2017b). A Guide to Best Practice for Watching Marine Wildlife. Available from: https://www.nature.scot/sites/default/files/2017-06/Publication%202017%20-%20A%20Guide%20to%20Best%20Practice%20for%20Watching%20Marine%20Wildlife%20SMWWC%20-%20Part%202%20-%20April%202017%20%28A2263517%29.pdf [Accessed 15/12/2024].

NatureScot (2020). Seasonal Periods for Birds in the Scottish Marine Environment. Available online at: https://www.nature.scot/sites/default/files/2020-10/Guidance%20note%20-%20Seasonal%20definitions%20for%20birds%20in%20the%20Scottish%20Marine%20Environment.pdf [Accessed 11/12/2024].

NatureScot (2023a). SiteLink - Inner Hebrides and the Minches SAC. JNCC SAC Data Form (Standard Data Form). Available online at: https://sitelink.nature.scot/site/10508 [Accessed 11/12/2024].

NatureScot (2023b). SiteLink - Priest Island (Summer Isles) SPA. Available online at: https://sitelink.nature.scot/site/8567 [Accessed 11/12/2024].

National Marine Fisheries Service (NMFS) (2014). Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals—Acoustic thresholds for Onset of Permanent and Temporary Threshold Shifts. Federal Register 79(19):4672-4673. Available online at: https://tethys.pnnl.gov/sites/default/files/publications/Draft-Acoustic-Guidance-2013.pdf [Accessed 24/04/2023].

NMFS (2018). 2018 Revision to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0). Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. [Accessed 09/12/2024].

NOAA Technical Memorandum NMFS-OPR-59. April 2018. Available online at: https://repository.library.noaa.gov/view/noaa/17892 [Accessed 09/12/2024].

Otani, S., Naito, Y., Kato, A. and Kawamura, A. (2000). Diving behavior and swimming speed of a free-ranging harbour porpoise, Marine Mammal Science, 16(4), 811-814. Available online at: https://doi.org/10.1111/j.1748-7692.2000.tb00973.x [Accessed 09/12/2024].

Paxton CGM, Scott-Hayward LAS & Rexstad E (2014). Review of available statistical approaches to help identify Marine Protected Areas for cetaceans and basking shark. Scottish Natural Heritage Commissioned Report No. 573, 47pp. Available online at: https://www.nature.scot/sites/default/files/2017-11/Publication%202014%20-%20SNH%20Commissioned%20Report%20573%20-%20Review%20of%20available%20statistical%20approaches%20to%20help%20identify%20Marine%20Protected%20Areas%20for%20cetaceans%20and%20basking%20shark.pdf [Accessed 09/12/2024].

Reid, J.B., Pollock, C.M., and Mavor, R. (2001). Seabirds of the Atlantic Frontier, north and west of Scotland. Continental Shelf Research, Volume 21, Issues 8-10. Pp. 1029 – 1045. Available online at: https://doi.org/10.1016/S0278-4343(00)00123-0 [Accessed 24/04/2023].

Richardson, J., Greene, C., Malme, C, Thomson, D. 1995. Marine Mammals and Noise ,Chapter 4 - Sound Propagation by Charles I. Malme, Bolt Beranek and Newman Inc., Editor(s): W. John Richardson, Charles R. Greene, Charles I. Malme, Denis H. Thomson, ,Academic Press, 1995.

Rodríguez, A., García, D., Rodríguez, B., Cordona, E., Parpal, L., Pons, P. 2015. Artificial lights and seabirds: is light pollution a threat for the threatened Balearic petrels? SpringerLink, Journal of Ornithology, Volume 156, ISSUE 4. Available online at: https://doi.org/10.1007/s10336-015-1232-3 [Accessed 09/12/2024].

RSPB (2023). Storm petrel. Available online at: https://www.rspb.org.uk/birds-and-wildlife/wildlife-guides/bird-a-z/storm-petrel/ [Accessed 11/12/2024].

SCOS (2021). Scientific advice on matters related to the management of seal populations: 2021. Available online at: http://www.smru.st-andrews.ac.uk/files/2022/08/SCOS-2021.pdf [Accessed 21/04/2023].

Scottish Government (2020). The protection of Marine European Protected Species from injury and disturbance Guidance for Scottish Inshore Waters (July 2020 Version). Marine Scotland. Available online at: https://www.gov.scot/publications/marine-european-protected-species-protection-from-injury-and-disturbance/ [Accessed 11/12/2024].

Sims, D.W. (2008). Chapter 3 Sieving A Living: A Review of the Biology, Ecology and Conservation Status of the Plankton-Feeding Basking Shark Cetorhinus maximus. Advances in Marine Biology, 54: 171-220. Available online at: https://doi.org/10.1016/S0065-2881(08)00003-5 [Accessed 10/12/2024].

Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene, C. R., Kastak, D. (2007). Marine mammal noise exposure criteria: initial scientific recommendations. Aquatic Mammals, 33: 411-509. Available online at: https://doi.org/10.1080/09524622.2008.9753846 [Accessed 09/12/2024].

Southall, B.L, Finneran, J.L., Reichmuth, C., Nachtigall, P.E., Ketten D.R., Bowles, A.E., Ellison, W.T., Nowacek, D.P., and Tyack, P. (2019). 'Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects'. Aquatic Mammals, 45:125-232. Available online at: https://doi.org/10.1578/AM.45.2.2019.125 [Accessed 09/12/2024].

Thompson, D. 2015. Parameters for collision risk models. Report by Sea Mammal Research Unit, University of St Andrews, for Scottish Natural Heritage. 61, 363-378.

Weir, C., Hodgins, N., Dolman, S. and Walters, A. (2019). Risso's dolphins (Grampus griseus) in a proposed Marine Protected Area off east Lewis (Scotland, UK), 2010– 2017. Journal of the Marine Biological Association of the United Kingdom. Cambridge University Press. Available online at: https://doi.org/10.1017/S0025315418000516 [Accessed 09/12/2024].

Westgate, A.J., Head, A.J., Berggren, P., Koopman, H.N. & Gaskin, D.E. 1995. Diving behaviour of harbour porpoises Phocoena phocoena. Canadian Journal of Fisheries and Aquatic Sciences 52:1064-73. Available online at: https://doi.org/10.1139/f95-104 [Accessed 11/12/2024].

Williams, T.M. (2009). Encyclopedia of Marine Mammals 1140-47. ed Perrin, W.F., Würsig, B. and Thewissen, J.G.M. Academic Press (2009). Available online at: https://doi.org/10.1016/C2015-0-00820-6 [Accessed 11/12/2024].

Witt, M.J., Hardy, T., Johnson, L., McClellan, C.M., Pikesley, S.K., Ranger, S., Richardson, P.B., Solandt, J.L., Speedie, C., Williams, R. and Godley, B.J., (2012). Basking sharks in the northeast Atlantic: spatio-temporal trends from sightings in UK waters. Marine Ecology Progress Series, 459: 121-134. Available online at: https://dx.doi.org/10.3354/meps09737 [Accessed 09/12/2024].

Appendix A Survey Corridor Coordinates

Coordinates for the Survey Area (WGS 84)[8]					
Degrees, Minutes and Seconds		Degrees and Decimal Minutes		Decimal Degrees	
Latitude	Longitude	Latitude	Longitude	Latitude	Longitude
58° 11' 18.653903" N	6° 22' 23.717906" W	58° 11.310898' N	6° 22.395298' W	58.18851497	-6.373254974
58° 10' 31.207998" N	6° 20' 58.040214" W	58° 10.520133' N	6° 20.967337' W	58.17533556	-6.349455615
58° 10' 28.794324" N	6° 16' 6.475609" W	58° 10.479905' N	6° 16.107927' W	58.17466509	-6.268465447
58° 9' 21.427715" N	6° 11' 2.802595" W	58° 9.357129' N	6° 11.04671' W	58.15595214	-6.184111832
58° 8' 16.494662" N	6° 3' 44.745178" W	58° 8.274911' N	6° 3.745753' W	58.13791518	-6.062429216
58° 7' 35.393984" N	6° 0' 37.617296" W	58° 7.5899' N	6° 0.626955' W	58.12649833	-6.010449249
58° 7' 21.570359" N	5° 58' 23.440973" W	58° 7.359506' N	5° 58.390683' W	58.12265843	-5.973178048
58° 0' 5.878512" N	5° 44' 12.233879" W	58° 0.097975' N	5° 44.203898' W	58.00163292	-5.736731633
57° 59' 33.397591" N	5° 43' 50.600215" W	57° 59.556627' N	5° 43.843337' W	57.99261044	-5.730722282
57° 57' 38.47298" N	5° 40' 22.257034" W	57° 57.641216' N	5° 40.370951' W	57.96068694	-5.672849176
57° 57' 23.372888" N	5° 39' 31.07389" W	57° 57.389548' N	5° 39.517898' W	57.95649247	-5.658631636
57° 56' 55.969742" N	5° 35' 55.558198" W	57° 56.932829' N	5° 35.92597' W	57.94888048	-5.598766166
57° 55' 59.360038" N	5° 33' 6.538442" W	57° 55.989334' N	5° 33.108974' W	57.93315557	-5.551816234
57° 56' 3.114222" N	5° 32' 6.995058" W	57° 56.051904' N	5° 32.116584' W	57.9341984	-5.535276405
57° 55' 25.417769" N	5° 28' 10.444876" W	57° 55.423629' N	5° 28.174081' W	57.92372716	-5.469568021
57° 55' 14.493382" N	5° 24' 27.693497" W	57° 55.241556' N	5° 24.461558' W	57.92069261	-5.407692638
57° 52' 5.125102" N	5° 17' 18.015176" W	57° 52.085418' N	5° 17.300253' W	57.86809031	-5.288337549
57° 51' 25.849528" N	5° 14' 31.505057" W	57° 51.430825' N	5° 14.525084' W	57.85718042	-5.242084738
57° 50' 45.068528" N	5° 12' 55.914696" W	57° 50.751142' N	5° 12.931912' W	57.84585237	-5.21553186
57° 50' 27.62173" N	5° 13' 1.820561" W	57° 50.460362' N	5° 13.030343' W	57.84100604	-5.217172378
57° 51' 37.151413" N	5° 17' 48.937258" W	57° 51.61919' N	5° 17.815621' W	57.86031984	-5.296927016

[8] Landward boundaries of the survey corridor are defined by Mean High Water Springs (MHWS).

Coordinates for the Survey Area (WGS 84)[8]					
Degrees, Minutes and Seconds		Degrees and Decimal Minutes		Decimal Degrees	
Latitude	Longitude	Latitude	Longitude	Latitude	Longitude
57° 53' 9.396121" N	5° 20' 58.103182" W	57° 53.156602' N	5° 20.968386' W	57.88594337	-5.349473106
57° 54' 21.859211" N	5° 24' 21.055406" W	57° 54.36432' N	5° 24.350923' W	57.906072	-5.405848724
57° 54' 44.043779" N	5° 24' 55.954123" W	57° 54.734063' N	5° 24.932569' W	57.91223438	-5.415542812
57° 54' 53.804952" N	5° 28' 25.559904" W	57° 54.896749' N	5° 28.425998' W	57.91494582	-5.47376664
57° 55' 30.697306" N	5° 32' 13.275467" W	57° 55.511622' N	5° 32.221258' W	57.9251937	-5.537020963
57° 55' 27.093043" N	5° 33' 20.815078" W	57° 55.451551' N	5° 33.346918' W	57.92419251	-5.555781966
57° 56' 26.54524" N	5° 36' 21.396701" W	57° 56.442421' N	5° 36.356612' W	57.94070701	-5.605943528
57° 56' 52.24929" N	5° 39' 49.613814" W	57° 56.870822' N	5° 39.826897' W	57.94784703	-5.663781615
57° 57' 12.565865" N	5° 40' 59.534134" W	57° 57.209431' N	5° 40.992236' W	57.95349052	-5.683203926
57° 59' 14.683517" N	5° 44' 41.028947" W	57° 59.244725' N	5° 44.683816' W	57.98741209	-5.744730263
57° 59' 45.962102" N	5° 45' 0.964883" W	57° 59.766035' N	5° 45.016081' W	57.99610058	-5.750268023
58° 6' 53.776656" N	5° 58' 55.691641" W	58° 6.896278' N	5° 58.928194' W	58.11493796	-5.982136567
58° 7' 3.907322" N	6° 0' 53.12245" W	58° 7.065122' N	6° 0.885374' W	58.11775203	-6.014756236
58° 7' 45.542636" N	6° 4' 2.886344" W	58° 7.759044' N	6° 4.048106' W	58.1293174	-6.067468429
58° 8' 50.93506" N	6° 11' 23.144086" W	58° 8.848918' N	6° 11.385735' W	58.14748196	-6.189762246
58° 9' 57.932737" N	6° 16' 25.333478" W	58° 9.965546' N	6° 16.422225' W	58.16609243	-6.273703744
58° 9' 51.403993" N	6° 18' 31.848066" W	58° 9.856733' N	6° 18.530801' W	58.16427889	-6.308846685
58° 10' 0.339895" N	6° 21' 19.45004" W	58° 10.005665' N	6° 21.324167' W	58.16676108	-6.355402789
58° 10' 25.288954" N	6° 22' 27.993227" W	58° 10.421483' N	6° 22.466554' W	58.17369138	-6.374442563
58° 10' 52.394903" N	6° 23' 3.410703" W	58° 10.873248' N	6° 23.056845' W	58.18122081	-6.384280751