Scottish and Southern Electricity Networks - Transmission

LT597 Eday Orkney Inter-Island Connection

Marine Surveys EPS Risk Assessment

ASSIGNMENT A100782-S05
DOCUMENT A-100782-S05-A-REPT-002

XODUS

Aberdeen

5th Floor Capitol Building
429-431 Union Street . Aberdeen
AB11 6DA . UK

T +44 (0)1224 628300
[Redacted]

www.xodusgroup.com

REVISIONS & APPROVALS

This document has been prepared by Xodus Group exclusively for the benefit and use of Scottish and Southern Electricity Networks - Transmission. Xodus Group expressly disclaims any and all liability to third parties (parties or persons other than Scottish and Southern Electricity Networks - Transmission) which may be based on this document.

The information contained in this document is strictly confidential and intended only for the use of Scottish and Southern Electricity Networks - Transmission. This document shall not be reproduced, distributed, quoted or made available – in whole or in part – to any third party other than for the purpose for which it was originally produced without the prior written consent of Xodus Group.

The authenticity, completeness and accuracy of any information provided to Xodus Group in relation to this document has not been independently verified. No representation or warranty express or implied, is or will be made in relation to, and no responsibility or liability will be accepted by Xodus Group as to or in relation to, the accuracy or completeness of this document. Xodus Group expressly disclaims any and all liability which may be based on such information, errors therein or omissions therefrom.

[Redacted]

REV	DATE	DESCRIPTION	ISSUED	CHECKED	APPROVED	CLIENT
A01	29/05/2025	Issued for Use	[Redacted]			SSEN-T
R02	22/05/2025	Issued for Review				SSEN-T
R01	09/05/2025	Issued for Review				SSEN-T

CONTENTS

ACRONYMS

ACRONYM	DEFINITION
AEoSI	Adverse Effects on Site Integrity
DDV	Drop Down Video
EPS	European Protected Species
FCS	Favourable Conservation Status
HRA	Habitats Regulations Appraisal
IAMMWG	Inter-Agency Marine Mammal Working Group
IROPI	Imperative Reason of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
LSE	Likely Significant Effects
MBES	Multi Beam Echosounder
MEA	Marine Environmental Assessment
MMO	Marine Mammal Observer
MMPP	Marine Mammal Protection Plan
NCMPA	Nature Conservation Marine Protection Area
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PAM	Passive Acoustic Monitoring
PCPT	Piezo Cone Penetration Testing
PSA	Particle Size Analysis
PTS	Permanent Threshold Shift
SAC	Special Area of Conservation
SBP	Sub Bottom Profiler
SCANS	Small Cetaceans in European Atlantic Waters and the North Sea
SEL	Sound Exposure Level
SMWWC	The Scottish Marine Wildlife Watching Code

ACRONYM	DEFINITION
SPA	Special Protection Area
SPL	Sound Pressure Level
SSEN	Scottish and Southern Electricity Networks
SSS	Side Scan Sonar
SSSI	Site of Special Scientific Interest
UHRS	Ultra-High-Resolution Seismic
USBL	Ultra-shore Baseline
UXO	Unexploded Ordnance
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 a licence under the Electricity Act 1989 for the transmission of electricity in the north of Scotland, including Orkney. As the licenced electricity Transmission Owner (TO) for this region, SSEN Transmission has a statutory duty to provide an economic and efficient system for the transmission of energy, and to ensure that its assets are installed and maintained to enable a safe, secure and reliable transmission of power.

SSEN Transmission is currently looking at taking forward a number of strategic projects which are aimed at expanding the transmission network across northern Scotland, identified as being required to facilitate the substantial increase in renewable energy generation and the subsequent increasing demand for renewable energy connections.

As part of these strategic SSEN Transmission projects, the Eday Orkney Inter-Island Connection (hereafter 'the Project') is planned to allow for the transmission of power via a High Voltage Alternating Current (HVAC) subsea cable between the island of Eday to the Finstown substation on Mainland Orkney. To inform the Project development, SSEN Transmission are planning to undertake marine surveys to gather geophysical, geotechnical and environmental data. The proposed survey activities will enable SSEN Transmission to:

- Gather data on the condition and profile of the seabed to better inform decisions on project design (e.g., installation techniques) and cable routing for the Project;
- Gather data on the benthic environment to inform the Marine Environmental Assessment (MEA) that will support the Marine Licence Application for the Project; and
- Inform requirements for future survey works including the nature and extent of future surveys.

The survey activities for the Project are scheduled to be undertaken within a five-year period, starting 20th October 2025 and concluding 19th October 2030. Further detail on the survey activity schedule can be found in Section 2.2.

1.1.1 Area of Interest

A survey Area of Interest (AoI) has been identified between Eday and Mainland Orkney, within which the Project's proposed cable corridor will be located, as illustrated in Figure 1-1.

SSEN Transmission are planning on undertaking the proposed marine surveys within the AoI for the Project. The total AoI is approximately 1,646 km^2 and is located entirely within Scottish Territorial Waters (<12 Nautical Miles (NM) from Mean High Water Springs (MHWS)), as shown in Figure 1-1. It should be noted that cable routeing and optioneering is currently being undertaken, and as such the actual survey corridor will be a smaller and more refined area within the AoI.

The coordinates for the Project AoI are provided in Appendix A.

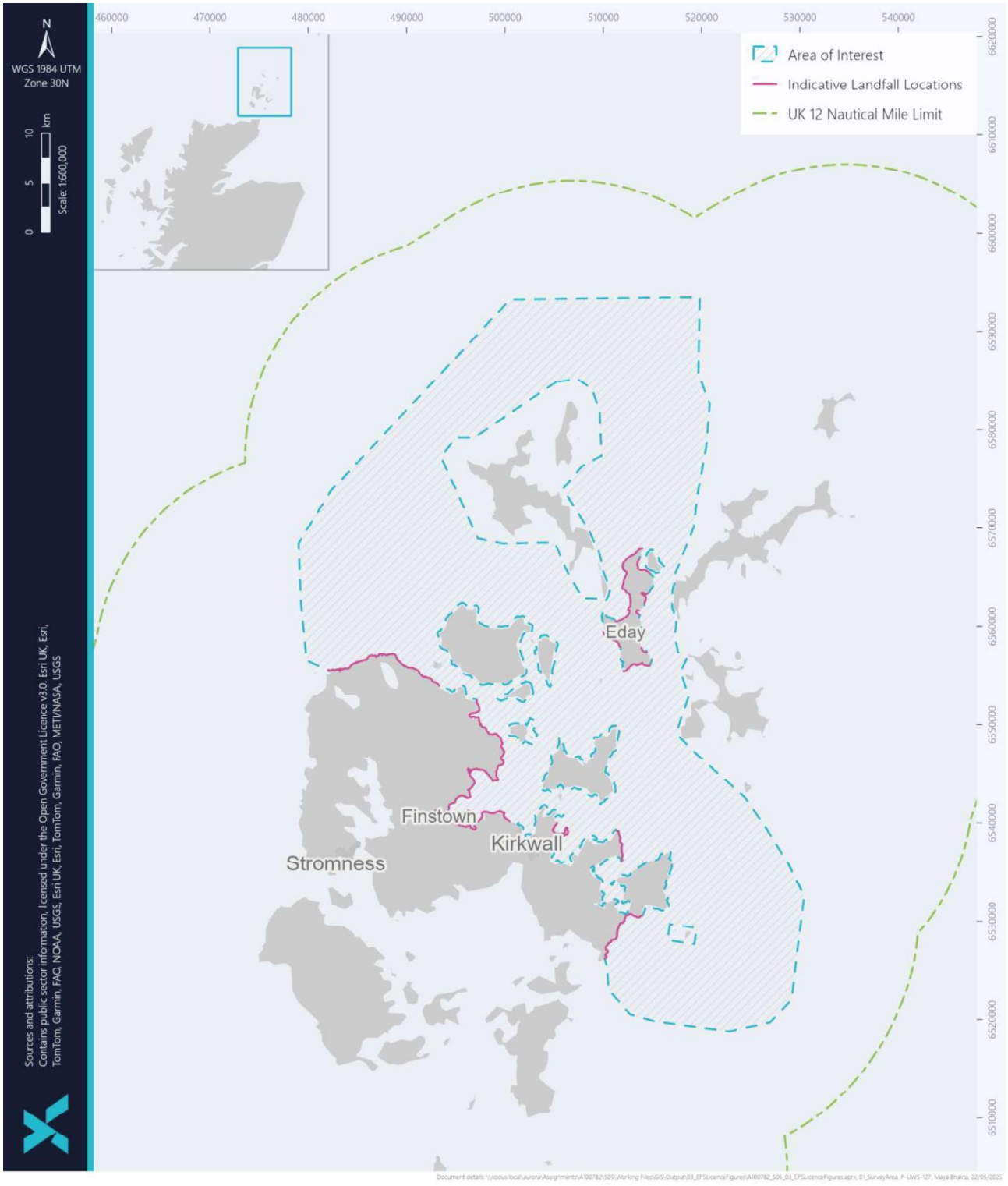


Figure 1-1 Survey Area of Interest

1.2 Report Purpose

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

1. An assessment of potential impacts on cetaceans and otters, and determination of the need for an 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 designated sites as required by the Habitats Regulations;
4. An assessment of whether the proposed activities are capable of affecting (other than insignificantly) Nature Conservation Marine Protected Areas (NCMPAs), as required under the Marine (Scotland) Act 2010; and
5. 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

All cetacean species (i.e., whale, dolphin and porpoise) that occur within United Kingdom (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 also listed as individual EPS and fall under Annex II of the Habitats Directive, which enables the designation of Special Area of Conservation (SACs) for those species.

Although the UK is no longer part of the European Union (EU), in Scotland, the Habitats Directive is transposed into law by the Habitats Regulations within Scottish Territorial Waters (12 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 EPS;*
  - *ii. disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;*
  - *iii. disturb such an animal while it is rearing or otherwise caring for its young;*

iv. obstruct access to a breeding site or resting place of such an animal, or otherwise to deny the animal use of the breeding site or resting place;

v. Disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs; 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.

Determining the Need for an EPS Licence

The assessments presented in this report are 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. An EPS Licence may be required where the potential for disturbance remains, and will be determined based on outcomes of the EPS Risk Assessment.

If an EPS licence is required, Marine Directorate - Licensing Operation Team's (MD-LOT) consideration of whether an EPS Licence can be granted will comprise of 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 whether there are no satisfactory alternatives to the activity proposed (that would avoid the risk of offence); and
3. That the licensing of the activity will not be detrimental to the maintenance of the population of the species concerned at a Favourable Conservation Status (FCS).

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 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.

The coastal areas of Orkney provide good quality habitat for otters, and the species is widespread on Orkney, particularly in the vicinity of aquatic environments, meaning otters may be present during the survey activities (Orkney Islands Council, 2020).

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, within the vicinity of onshore and coastal otter habitat. 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) in the event that otter are found to be a qualifying feature of a European site considered within the assessment.

1.3.2 Basking Sharks

Basking sharks are protected under Section 9 of the Wildlife and Countryside Act 1981 (as amended) 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 Wildlife and Countryside Act 1981 (as amended), strengthening the legal protection for threatened species to include 'reckless' acts, and specifically makes it an offence to intentionally or recklessly disturb or harass basking sharks.

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 3.5.

1.4 Protected Sites Overview

1.4.1 European Sites

The European Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC) are transposed into Scottish Law by the Habitats Regulations. The European Habitats Directive (92/43/EEC) aims to promote the maintenance of biodiversity, by requiring EU Member States 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 European importance.

European sites, including Special Protection Areas (SPAs) and SACs, retain the same protections as prior to the UK leaving the EU. However, the UK European Sites now form part of the UK Site Network, rather than the former 'Natura 2000' sites.

As part of the protection measures for European sites under the Habitat Regulations, 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 through the Habitats Regulations Appraisal (HRA) process. The HRA process requires that any proposal with the potential to negatively impact European sites or their designated features, must be subject to an HRA by the Competent Authority, and if necessary, an Appropriate Assessment (AA). The HRA process ensures that an activity cannot be consented if it may cause adverse effects on the integrity of a European Site, unless there are no alternatives, or there is an Imperative Reason of Overriding Public Interest (IROPI) for the activity to proceed.

If the survey activities are found to have a potential LSE on a European site, this report will provide sufficient detail to inform the HRA process.

1.4.1 Marine Protected Areas

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 NCMPA, or any ecological or geomorphological process on which the conservation of any protected feature in an NCMPA is dependent. If MD-LOT determine there is or may be a significant risk of a project impeding the achievement of the Conservation Objectives, then they must notify the relevant conservation bodies (e.g., NatureScot).

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 decisions do not cause a significant risk to the Conservation Objectives of any NCMPA. If the survey activities are found to have a potential to affect (other than insignificantly) the achievement of the Conservation Objectives of an NCMPA, this report will provide sufficient detail to allow MD-LOT to ascertain the potential effects on the identified NCMPAs.

1.4.2 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 have been designated through The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014, which was amended with additional sites in 2017. These haul-out sites are protected under Section 117 of the Marine (Scotland) Act 2010 and have been designated to strengthen the protection of seals when they are at their most vulnerable on land and to provide additional protection from intentional or reckless harassment whilst seals occupy these important coastal sites.

1.4.3 Selection Criteria for Protected Sites

The potential for the proposed survey activities to impact protected sites (including designated seal haul-outs) needs to be considered, 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 AoI;
- SACs (including proposed and candidate sites) with harbour seal features within 50 km of the proposed AoI and breeding grey seal within 20 km of the proposed AoI;
- Designated seal haul-outs or seal breeding sites that overlap with or located within 500 m of the proposed AoI;
- 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 AoI;
- SACs and NCMPAs (including proposed and candidate sites) with benthic interests which are within the proposed AoI; and
- SACs and NCMPAs (including proposed and candidate sites) with otter features that overlap with or located within 500 m of the proposed AoI.

2 DESCRIPTION OF PROJECT ACTIVITIES

2.1 Overview

The proposed geophysical, benthic, and geotechnical surveys are required to determine seabed conditions and to characterise the benthic environment, including identifying protected features or habitats.

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 activities, as detailed in Table 2-1. It is anticipated that the testing and calibration will take approximately 12 hours.

The exact location of the testing and calibration sites is unknown at this stage, but where possible this activity will be carried out within the AoI. However, it is noted that specific bathymetric conditions and features are required to facilitate testing and calibration; where these are not available within the AoI, an alternative location will be utilised.

Since the vessel(s), equipment, and activities required for testing and calibration will be the same as those used during the survey activities, the potential impacts on protected species and sites resulting from testing and calibration will be analogous to those resulting from the main survey phase. As such, testing and calibration is not specifically considered by this assessment. All mitigation measures applied to the main survey works (as detailed in Section 5) will also be implemented during testing and calibration of the survey equipment.

2.1.2 Survey Activities

The surveys will typically be carried out using survey vessels. Survey vessel selection and deployment will be made prior to survey operations and will be informed by a number of factors including 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 2-1 presents the types of activity that are associated with the geophysical, geotechnical and environmental surveys.

Table 2-1 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)
Geophysical Survey	Ultra-shore 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

ACTIVITIES	
	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 2-1). The potential survey equipment is described further in Table 2-2.

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

SYSTEM / SURVEY EQUIPMENT	DESCRIPTION
Geophysical Survey	
Ultra-Short Baseline (USBL)	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)	Multi-beam echo-sounders are used to obtain detailed 3-dimensional (3D) maps of the seafloor which show water depths. They measure water depth by recording the two-way travel time of a high frequency pulse emitted by a transducer. The beams produce a fanned arc composed of individual beams (also known as a swathe). Multi-beam echo-sounders can, typically, carry out 200 or more simultaneous measurements. With regards to this Project, the MBES specifications are to be high resolution; Max ping space of 25 cm or 9 pings per square metre with towed set up.
Sidescan Sonar (SSS)	Side-scan sonar is used to generate an accurate image of the seabed, which may include 3D imagery. An acoustic beam is used to obtain an accurate image of a narrow area of seabed to either side of the instrument by measuring the amplitude of back-scattered return signals. The instrument can either be towed behind a ship at a specified depth or mounted on to a ROV. The frequencies used by side-scan sonar are generally very high and outside of the main hearing range of all marine species (National Oceanic and Atmospheric Administration (NOAA), 2018). The higher frequency systems provide higher resolution but shorter-range measurements.

SYSTEM / SURVEY EQUIPMENT	DESCRIPTION
Sub-Bottom Profiler (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.
Ultra-High-Resolution Seismic (UHRS) system	An UHRS system 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 or pinnipeds.
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 or pinnipeds.
Benthic Survey	
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 ROV.

SYSTEM / SURVEY EQUIPMENT	DESCRIPTION
Drop Down Video (DDV)/ 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 underwater 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 underwater sound. Therefore, this technology does not require any further consideration with respect to potential injury or disturbance of cetaceans and pinnipeds. USBL may be used to monitor the position of the 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 underwater sound. Therefore, this technology does not require any further consideration with respect to possible injury or disturbance to cetaceans and pinnipeds. Note that USBL beacons are often mounted on this equipment to determine position.
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. As the survey contractor has not yet been onboarded by SSEN Transmission, the exact details of the borehole location, design and technique are not yet known. Once these details are known, SSEN Transmission will apply for all necessary Marine Licences or Marine Licence Exemptions.

2.2 Activity Schedule

The survey activities are scheduled to be undertaken between20th October 2025 and 19th October 2030, over a total survey window of 5 years. However, the survey activities will be undertaken in distinct campaigns of approximately 50 days in each year, resulting in approximately 250 days of survey activity across the survey window. 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;
- 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 purpose of this EPS Risk Assessment is to determine whether an EPS licence and a basking shark derogation are required for the proposed survey works, by identifying the potential for injury and disturbance to EPS. This section of the document focuses on the 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. While pinnipeds are not classified as EPS, this section also includes an assessment of underwater sound impacts on them, supported by sound modelling, to inform the Protected Sites Impact Assessment in Section 4

Underwater sound emissions from geophysical survey equipment is 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 have 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 3-1 below. While some survey techniques and activities may introduce underwater sound to the marine environment, other activities do not operate in relevant frequency ranges or generate sufficient underwater sound levels to be considered as potential sources of sound-related injury or disturbance to EPS and pinnipeds. Therefore, these have been screened out and will not be considered further within this assessment, as indicated in Table 3-1.

Table 3-1 Overview of Potential Impacts of Marine Survey Equipment on EPS and Pinnipeds within the Vicinity of the AoI

ACTIVITY / EQUIPMENT	EXAMPLE EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (kHz)	INDICATIVE SPL[1] (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 Root Mean Square (RMS) > 50 m length vessel = 165 – 185 RMS	No – The source levels associated with vessels are likely to be too low to result in injury, and the presence of three survey vessels in the region does not constitute a material change from baseline conditions. It is acknowledged that vessels pose a 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, 2017a), as detailed in Section 5.
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.			
ROV and 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).

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

ACTIVITY / EQUIPMENT	EXAMPLE EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (kHz)	INDICATIVE SPL[1] (dB re 1µPa)	FURTHER INFORMATION REQUIRED FOR EPS RISK ASSESSMENT?
Geophysical Survey					
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.
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 3-3). Hence, no potential for injury or disturbance exists (NOAA, 2018).
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 3-3. Hence, no potential for injury or disturbance exists (NOAA, 2018).
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 – 15(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.

ACTIVITY / EQUIPMENT	EXAMPLE EQUIPMENT	POTENTIAL IMPACTS	FREQUENCY RANGE (kHz)	INDICATIVE SPL[1] (dB re 1µPa)	FURTHER INFORMATION REQUIRED FOR EPS RISK ASSESSMENT?
UHRS System	The Dura-Spark; The Dura-Spark UHD 240/400; The UHD Sparker	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.	0.05 – 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

Around 20 species of cetacean have been recorded in Scottish waters, but six species are noted as being relatively common in the AoI (NMPI, 2025; NatureScot, 2025): harbour porpoise (*Phocoena phocoena*), minke whale (*Balaenoptera acutorostrata*), white-beaked dolphin (*Lagenorhynchus albirostris*), Risso's dolphin (*Grampus griseus*) and killer whale (*Orcinus orca*). The following summarises those species regularly sighted within the AoI.

- Harbour porpoises are distributed throughout coastal and shelf wasters across the sub-Arctic, favouring the cool waters of the North Atlantic and the North Pacific (Whale and Dolphin Conservation (WDC), 2025a). Harbour proposes frequent shallow bays, estuaries and tidal channel (<200 m in depth) with the majority of animal sightings occurring within 10 km of the coast (WDC, 2025a). Harbour porpoise is the most abundant cetacean species in the Orkney Islands and is likely to be present in the vicinity of the AoI throughout the year. The density of harbour porpoise in the AoI is considered low with 0.2813 animals/km^2 (Giles *et al.*, 2023).
- Minke whale is the most abundant of the baleen whales within Scottish waters (NatureScot, 2023a). Minke whales occur in waters <200 m in depth and can commonly be seen in coastal waters between July and September (NatureScot, 2023a). They feed mainly in shallower water over the continental shelf (<200 m) and regularly appear around shelf banks and mounds, or near fronts where zooplankton and fish are concentrated at the surface. They are also commonly seen in the strong currents around headlands and small islands, where they can come close to land, even entering estuaries, bays and inlets. Minke whale density in the vicinity of the AoI is considered to be relatively high, with 0.0116 animals/km^2 (Giles *et al.*, 2023), and this species is most often spotted around Scotland between June and August but may be present at any time between January and October (Hague *et al.*, 2020).
- White-beaked dolphins have a relatively limited distribution in the temperate and cold waters of the North Atlantic. White-beaked dolphins are typically found in water of <200 m in depth (WDC, 2025b). The white-beaked dolphin is recorded in Scottish waters in all months of the year and have an estimated density of 0.1352 animals/km^2 in the area. This is moderate in comparison to other regions around Scotland (Giles *et al.*, 2023).
- Risso's dolphins are predominantly distributed in deep waters, with only infrequent sightings in shallow inshore waters (Hague *et al.*, 2020). This species is resident year-round in Scotland, with the highest densities observed during the summer months. The estimated density of Risso's dolphin modelled by Paxton *et al.*, (2014) indicates a higher expected density in the northwest of Scotland around the Isle of Lewis compared with around the Orkney Islands. The density of Risso's dolphin recorded during the SCANS-IV survey in block CS-K was 0.0376 animals/km^2 (Giles *et al.*, 2023).
- Other species, such as killer whale and humpback whale (*Megaptera novaeangliae*) are seen infrequently in varying numbers and are occasional and/or seasonal visitors (Giles *et al.*, 2023; WDC, 2018). Over recent years killer whales have been sighted on a number of occasions off Orkney in the summer months, sometimes in pods, which are likely to migrate to Norwegian waters for the rest of the year (Orkney Cetacean Group, 2023; ORCA, 2023). These species do not occur frequently enough to require further assessment as there are no reliable population estimates to assess against.

The distribution, density, and abundance of the most commonly occurring cetacean species expected to occur around the AoI based on Gilles *et al. (*2023) and Inter-Agency Marine Mammal Working Group (IAMMWG) (2023)[2] are presented in Table 3-2 below.

[2] *Abundance estimates remain unchanged from IAMMWG (2022).*

Table 3-2 Population Parameters of Cetacean Species Potentially Present in the AoI

SPECIES NAME	ESTIMATED DENSITY ACROSS THE AOI* (INDIVIDUALS/km^2) (GILLES *et al.*, 2023)	ESTIMATED ABUNDANCE WITHIN THE AOI (1,645.8 km^2)	NORTH SEA (NS) MU / BIOGEOGRAPHICAL POPULATION ESTIMATE (IAMMWG, 2023)	PROPORTION OF THE MU POTENTIALLY AFFECTED BY SURVEY ACTIVITIES
Harbour porpoise	0.2813	462.96	346,601	0.13%
Risso's dolphin	0.0376	61.88	12,262	0.50%
Minke whale	0.0116	19.09	20,118	0.09%
White-beaked dolphin	0.1352	222.51	43,951	0.51%

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

3.2 Potential Impact from Survey Activities

Sound generated from the proposed survey activities constitute the greatest potential risk of injury or disturbance to cetaceans in the vicinity of the survey activities. Injury and disturbance from underwater sound can impact cetaceans and pinnipeds in the following ways:

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

To assess the potential for sound impacts on cetaceans and pinnipeds, predicted emission levels are compared to available estimated thresholds for injury and disturbance. Several threshold criteria and methods for determining how marine mammals perceive sound are available (e.g., the dBht method and other hearing weighted and linear measures) and each has its own advantages and disadvantages. Scottish Government (2020) guidance recommends using the injury and disturbance criteria proposed by Southall *et al.* (2007), which combine linear (un-weighted) peak Sound Pressure Levels (SPL) and weighted Sound Exposure Levels (SEL). Since the publication of this seminal paper, there has been mounting evidence of marine mammal auditory abilities in novel and well-studied species (e.g. harbour porpoise) which has led to updates in auditory thresholds for injury (NOAA, 2018; Southall *et al.*, 2019). Following regulator feedback, these updated hearing groups and thresholds for acoustic injury have been adopted herein and are detailed in Table 3-3 and Table 3-4 below.

If a sound emission consists of 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 and pinniped hearing groups has been summarised below in Table 3-3. These auditory bandwidths form the basis for screening out SSS and MBES from further assessment, as detailed in Table 3-1.

Table 3-3 Auditory Bandwidths Estimated for Cetaceans (Southall et al., 2019; NOAA, 2018)

HEARING GROUP	ESTIMATED AUDITORY BANDWIDTH
Low-frequency cetaceans (LF): (e.g., baleen whales, such as humpback whales, minke whales, 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 has been undertaken 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 created for two different types of sound:

- Impulsive: These sounds are short in duration (i.e. less than 1 second), temporary, and occupy a broadband bandwidth, and have rapid rise and decay times with a high peak pressure level; and
- Non-impulsive: These sounds can occupy a broadband, narrowband or tonal bandwidth, and may be brief, prolonged, continuous, or intermittent in nature. They are not characterised by rapid rise and decay times or a high peak pressure level.

The surveys will comprise acoustic equipment which emits multiple pulsed sound, as detailed within Table 3-1. The sound generated from this equipment will disperse through the water column, with sound pressure decreasing as distance from the sound source increases. Therefore, marine mammals will be exposed to a lower sound pressure further from the sound source. To assess the potential for injury or disturbance to marine mammals, 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 duel-metric approach has been adopted to identify the range of potential injury to marine mammals based on the source level including the peak pressure and cumulative SELs for each equipment type which requires consideration for sound-related injury (see Table 3-1). The thresholds which each marine mammal and pinniped hearing group may experience sound-related injury are presented Table 3-4. These thresholds are derived from measurements of marine mammal hearing, using weighting functions which account for peak hearing abilities for each group (NOAA, 2018).

Table 3-4 Criteria Considered in this Assessment for the Onset of Injury in Marine Mammals from Underwater Sound (NOAA, 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)
LF cetaceans	219	183	199
HF cetaceans	230	185	198
VHF cetaceans	202	155	173
Phocid pinnipeds in water (PW)	218	185	201

3.3.2 Disturbance

To evaluate the possibility of a disturbance offence (as defined in Section 1.3.1) resulting 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 to satisfy Regulation 39(1) and 39(2) of The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

In accordance with recent stakeholder feedback, 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 re 1 µPa), 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 3-5.

Table 3-5 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

Geophysical Survey Equipment

Underwater modelling has been undertaking using Xodus' SubsoniX model which was developed specifically for assessing environmental impacts due to underwater sound. 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 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 3-3, 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 calculated 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 be very high frequency 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 level 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 for USBL 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 milliseconds (Madsen *et al.*, 2006 and references therein), this duration was used as a maximum integration window for the received SPL_{rms}.

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 sounds (hammering down of casings, which were 180-mm diameter steel pipes);
- Vibrating sounds (vibration of casings that had been hammered down); and
- Drilling sounds (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 Sections 3.3.1. 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 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 noise (measured as 117.5 – 126.8 SPL_{rms}).

3.4.2 Injury Impacts

Geophysical Survey Equipment

Potential injury to cetaceans (i.e., injury which results from a Permanent Threshold Shift (PTS) in hearing abilities) is limited to impulsive sound sources which exceed the injury thresholds defined in Table 3-4.

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, and shown in Table 3-6 below. 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 other marine mammals (Table 3-6). 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 VHF hearing group (Table 3-6), which is represented by harbour porpoise in UK waters. Conversely, HF cetaceans seemed to constitute the hearing group with the lowest potential impact ranges for the peak SPL. 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 3-6).

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 of 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 equipment is extremely low when considering that the source is deployed from a moving vessel travelling at more than 2 ms^{-1} (i.e., 4 knots) and, in some cases, is being towed at depth (e.g., a USBL may be mounted on 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.

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 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 loss to absorption and transmission are much lower. As such, sound penetration below the seabed is achievable at lower powers and higher frequencies, which offer higher resolution imagery to the surveyor. Furthermore, when considering the directionality of 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 the resultant imagery. Animals would need to be at the seabed below the sound source to experience the full sound levels behind the modelled impact ranges.

The 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 Peak SPL 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 ms^{-1} (e.g., cruising minke whale swim speed is 3.25 ms^{-1} and harbour porpoise may swim up to 4.3 ms^{-1}) (Blix and Folkow,

1995; Otani *et al.*, 2000). Further, NatureScot (2016) has provided standard values for mean swimming speeds of various marine mammal species likely to occur in the project area, including harbour porpoise (1.4 ms^{-1}; Westgate *et al.*, 1995); harbour / grey seal (1.8 ms^{-1}; Thompson, 2015); and minke whale (2.1 ms^{-1}; Williams, 2009). To offer a representative model of the predicted sound exposure ranges of marine mammals moving away from the sound source, a mean swim speed of 1.5 ms^{-1} has been used in the calculations. Considering that the surveys themselves will take place while the vessel is moving, the cumulative SELs of all equipment types are expected to be 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. SBP and UHRS at 6kHz 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.

Table 3-6 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
			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
			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 AoI, 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.*

Percussive Boreholes

Table 3-7 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 3-7 Sound Modelling Results from Huang et al. (2023) for Injury Impacts from Percussive Boreholes (N/E No Exceedance of Thresholds)

ACTIVITY	FREQUENCY (kHz)	SPLPEAK (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	0.045[6]	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 described above for geophysical survey equipment, since the injury criteria is a cumulative SEL, for auditory injury to occur, an animal would have to remain within close proximity (<280 m) of the source over a sustained period of time. Percussive borehole activities are only required to inform the design of potential Horizontally Directional Drilled (HDD) ducts for the cable landfalls. Given that landfall locations will be in areas of a shallow water, very close to shore, they are not considered likely to provide any suitable harbour porpoise habitat. It is therefore considered to be highly unlikely that a harbour porpoise would be present in in the vicinity of a landfall and remain within 280 m of the source for a prolonged period. As such, it is concluded that there is no realistic risk of injury associated with the proposed percussive borehole activities, and hence marine mammal mitigation (beyond adherence to the Scottish Marine Wildlife Watching Code) is not required.

[5] *Dominant frequency below 10 kHz.*
[6] *Dominant frequency.*

3.4.3 Disturbance Impacts

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) may occur when an animal is at risk of a sustained or chronic disruption of behaviour or habitat use resulting in population-level effects. An assessment of potential disturbance impacts from USBL, SBP and UHRS operations is provided in the sections below.

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 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 3-8.

Table 3-8 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 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 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 3-8).

The number of individuals which may experience disturbance from the worst-case scenario for each activity type has been calculated in Table 3-9 below, based on the population parameters supplied in Table 3-2 above. In these calculations, the impact range serves as a radius with which to calculate the total area of coverage for a potential disturbance event associated with each survey activity.

Table 3-9 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*	UHRS and SBP**	
	19.5 – 33.5 kHz (0.02 km^2)	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	22.09	0.006%
Risso's Dolphin	<0.001	2.95	0.02%
Minke whale	<0.001	0.91	0.005%
White-beaked dolphin	<0.01	10.6	0.02%

**Estimated through a modelling approach using auditory thresholds for disturbance as defined by the 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, none of the biogeographical population MU for any of the EPS species known to regularly occur within the project area will incur significant impacts. For all of the proposed survey activities, 0.02% or less of the relevant biogeographic populations may be impacted by sound-related disturbance.

The greatest disturbance impacts to EPS are associated with the impulsive SBP and UHRS survey activities, where a disturbance range of 5 km is assumed based on the EDR for geophysical surveys (JNCC, 2020). Assuming disturbance out to this range results in prediction of approximately 22 harbour porpoise individuals being disturbed. Nonetheless, this only equates to 0.006% of the MU being potentially impacted by the survey activities (Table 3-9).

Furthermore, with regards to USBL, the number of animals within the disturbance range at any one time is predicted to be ≤0.01 individuals (Table 3-9). This means that on average, there will be no marine mammals within the disturbance range for 99.99% 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. 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. Therefore, an EPS licence for disturbance will not be required for the use of USBL, in line with Scottish Government guidance that activities predicted to disturb less than one individual being unlikely to require an EPS licence (Marine Scotland, 2021).

The survey activities are anticipated to be completed over approximately 250 days throughout the 5-year survey period (averaging 50 days per year). 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 AoI. 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.

Percussive Boreholes

Huang *et al.* (2023) estimated that hammering sound could be detected out to 1.9 km from the source and that drilling sounds 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 overrepresents 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 in close proximity to the survey activities.

However, 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 is expected to be required for disturbance of cetaceans potentially resulting from percussive borehole survey activities, in accordance with the Habitat Regulations.

3.5 Basking Shark

Basking sharks belong to the elasmobranch group (which includes sharks and rays). 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 (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.

This group, by nature, demonstrate a generally low sensitivity to sound pressure due to the fact that they do not have a swim bladder. The general hearing range of basking sharks is not defined; however, five other elasmobranch species have been found to have a hearing range between 20 Hz to 1 kHz. This hearing range may or may not be transferable to basking sharks (Macleod *et al.*, 2011). As the 20 Hz to 1 kHz range only encompasses a small portion of the sound profiles emitted during proposed survey works, and the activities are for a short duration, acoustic disturbance to basking sharks is not anticipated. On this basis, the potential impacts of underwater sound on basking shark have been screened out for further assessment.

The potential for vessels collision presents a potential risk for this slow-moving species. The potential for collision risk increases with vessel speed. As the survey vessels will be slow moving during cable survey activities, collision risk is anticipated to be generally low. SSEN Transmission will reduce collision risk 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 are only very rarely present within the coastal waters around Orkney (Paxton *et al.*, 2014). Considering information on their known distribution, it is considered extremely unlikely that interactions with basking sharks will occur, and hence, the potential for the proposed survey activities to result in intentional or reckless disturbance or harassment of this species is equally limited. However, as disturbance to basking sharks remains a possibility from vessel disturbance alone, an application for a Basking Shark Derogation Licence under the Wildlife and Countryside Act 1981 (as amended) will be submitted.

3.6 Cumulative Effects

The European Marine Energy Centre (EMEC) has active tidal test sites located within the AoI, including the Falls of Warness and Shapinsay Sound. Additionally, two further tidal developments (Stronsay Firth and Shapinsay Sound) are planned in the near future. It is acknowledged that there is the potential for cumulative effects to arise from pre-construction surveys, construction works and operational surveys for these assets were to coincide with the proposed survey activities. However, as described in the sections above, disturbance to EPS from the 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 are not expected.

3.7 Conclusions

It is anticipated that there will be no injurious impacts to cetaceans as a result of Project survey 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. As such, SSEN Transmission will apply for an EPS Licence in respect to this disturbance for 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 ≤0.01 individuals of any EPS species being exposed to disturbance at any given time. This, 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 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 minor and temporary disturbance to a few individual animals in a limited area.

4 PROTECTED SITES IMPACT ASSESSMENT

4.1 Relevant Protected Sites

Since an EPS Licence will be required for the proposed survey activities, it is also necessary to assess potential impacts from this activity on protected sites to inform the HRA process. The protected sites located in the vicinity of the AoI which have the potential to be impacted by the survey activities are outlined in Table 4-1 and shown in Figure 4-1, these are selected based on the criteria outlined in Section 1.4.3.

For each protected site that has the potential to be impacted by the surveys, relevant mitigation measures have been identified based on site-specific qualifying features and are included in Table 4-1. Further details of the mitigation measures are provided in Section 5. Some of the mitigation measures included in Section 5 may not be listed in Table 4-1 if they are not related to protecting designated features of those sites. However, all mitigation measures in Section 5 will be applied to all relevant activities, regardless of proximity to a protected site.

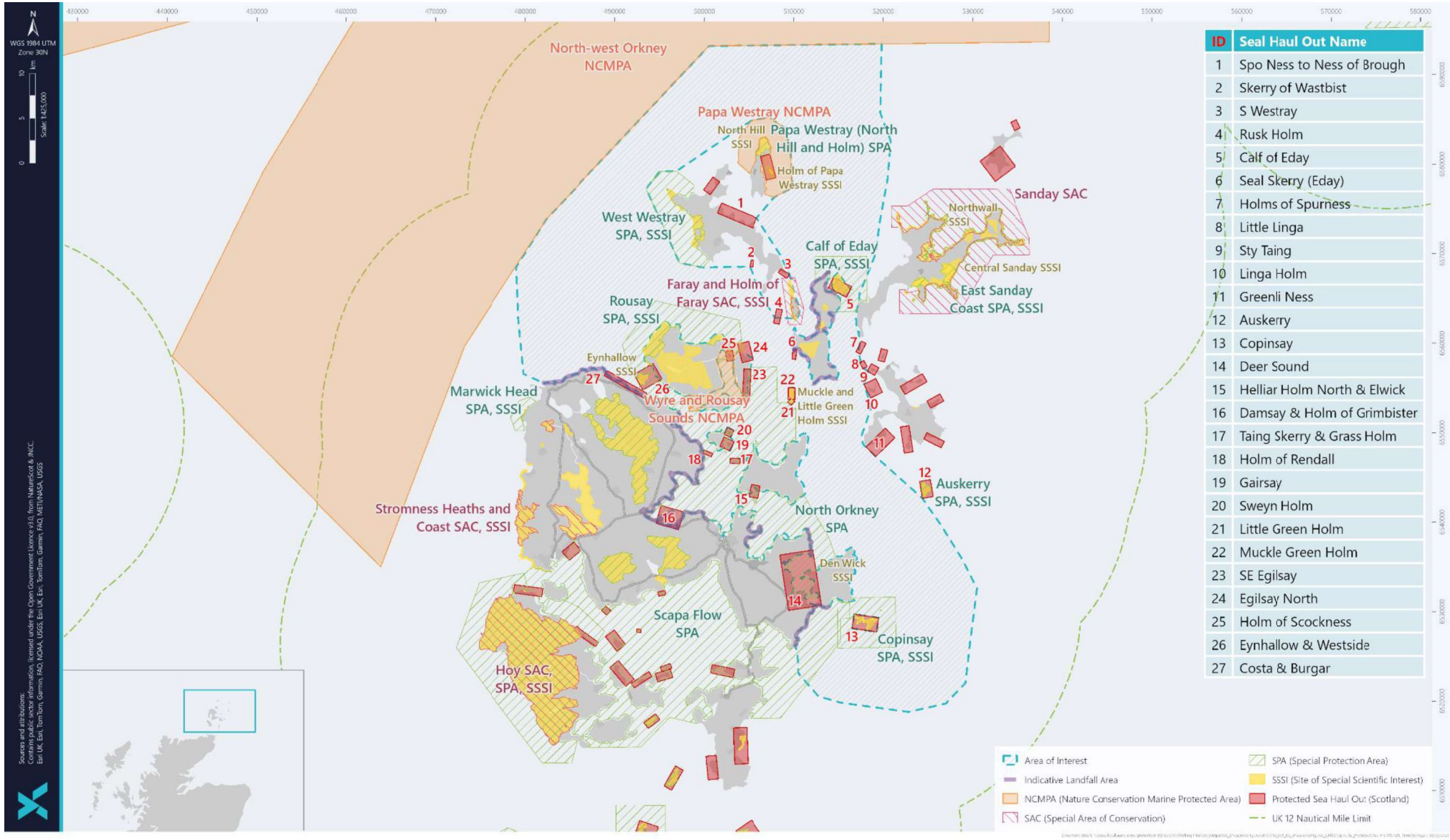
Significant adverse effects on any Site of Special Scientific Interest (SSSI) are not expected as these sites are designated for coastal or terrestrial features that will not be affected by the survey activities. Most designated features of SSSIs with connectivity with the marine environment are also qualifying features of European sites and will be screened into the Protected Sites Impact Assessment, where required, as per the criteria in Section 1.4.3.

Additionally, the following designated sites have been screened out of the assessment because the qualifying features are coastal or terrestrial and there is no pathway for the planned survey activities to impact on the qualifying features of these sites:

- Hoy SAC,
- Stromness Heaths and Coast SAC;
- Orkney Mainland Moors SPA and
- Loch of Stenness SAC.

Furthermore, initial landfall site selection works have been undertaken by SSEN Transmission for the Project. As part of these works several potential coastlines have been identified as potential landfall options and following more detailed assessment the preferred landfalls will be refined within these areas, the indicative landfall options are shown within Figure 4-1.

Given this, in areas where no indicative landfall option is identified, there will be no potential for intertidal or nearshore surveys (within 200 m of shore) and no potential for impacts from these works in these areas. As such, impacts on breeding and seal haul out sites are screened out where there is no identified protected site which falls within 500 m of the identified indicative landfall areas (as per screening criteria outlined in Section 1.4.3).



ID	Seal Haul Out Name
1	Spo Ness to Ness of Brough
2	Skerry of Wastbist
3	S Westray
4	Rusk Holm
5	Calf of Eday
6	Seal Skerry (Eday)
7	Holms of Spurness
8	Little Linga
9	Sty Taing
10	Linga Holm
11	Greenli Ness
12	Auskerry
13	Copinsay
14	Deer Sound
15	Helliar Holm North & Elwick
16	Damsay & Holm of Grimbister
17	Taing Skerry & Grass Holm
18	Holm of Rendall
19	Gairsay
20	Sweyn Holm
21	Little Green Holm
22	Muckle Green Holm
23	SE Egilsay
24	Egilsay North
25	Holm of Scockness
26	Eynhallow & Westside
27	Costa & Burgar

Figure 4-1 Protected Sites in the Vicinity of the AoI

Table 4-1 Protected Sites in the Vicinity of AoI

PROTECTED SITE	CRITERIA FOR POTENTIAL CONNECTIVITY TO THE SITE	MINIMUM DISTANCE TO PROTECTED SITE (km)[7]	RELEVANT QUALIFYING FEATURES OF DESIGNATED SITE	ACTIVITY	PROPOSED MITIGATION MEASURES	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT
SPAs						
North Orkney SPA	This designated site is within 2 km of the AoI	0 (overlaps with AoI)	• Great northern diver (*Gavia immer)* (non-breeding); • Red-throated diver (*Gavia stellata) (*breeding); • Slavonian grebe (*Podiceps auratus*) (non-breeding); and • Velvet scoter (*Melanitta fusca*) (non-breeding).	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys.	• M7, M8	Yes
Scapa Flow SPA	This designated site is within 2 km of the AoI	0 (overlaps with AoI)	• Black-throated diver (*Gavia arctica*) (non-breeding); • Eider (*Somateria mollissima*) (non-breeding); • Great northern diver (non-breeding); • Long-tailed duck (*Clangula hyemalis*) (non-breeding); • Red-breasted merganser (*Mergus serrator*) (non-breeding); • Red-throated diver (breeding); • Shag (*Phalacrocorax aristotelis*) (non-breeding); and • Slavonian grebe (non-breeding).	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys.	• M7, M8	Yes

[7] *With the exception of SPAs, distances have been measured as the at-sea distance for all protected sites, as straight-line distances may underestimate the distance between the Survey Area and the protected site where receptors are unable to travel over land.*

PROTECTED SITE	CRITERIA FOR POTENTIAL CONNECTIVITY TO THE SITE	MINIMUM DISTANCE TO PROTECTED SITE (km)[7]	RELEVANT QUALIFYING FEATURES OF DESIGNATED SITE	ACTIVITY	PROPOSED MITIGATION MEASURES	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT
Calf of Eday SPA	This designated site is within 2 km of the AoI	0 (overlaps with AoI)	• Cormorant (*Phalacrocorax carbo*) (breeding); • Fulmar (*Fulmarus glacialis*) (breeding); • Great black-backed gull (*Larus marinus*) (breeding); • Guillemot (*Uria aalge*) (breeding); • Kittiwake (*Rissa tridactyla*) (breeding); and • Seabird assemblage (breeding).	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys.	• M7, M8	Yes
Copinsay SPA	This designated site is within 2 km of the AoI	0 (overlaps with AoI)	• Fulmar (breeding); • Great black-backed gull (breeding); • Guillemot (breeding); • Kittiwake (breeding); and • Seabird assemblage (breeding).	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys.	• M7, M8	Yes
Rousay SPA	This designated site is within 2 km of the AoI	0 (overlaps with AoI)	• Artic skua (*Stercorarius parasitics*) (breeding); • Artic tern (*Sterna paradisaea*; breeding); • Fulmar (breeding); • Guillemot (breeding); • Kittiwake (breeding); and • Seabird assemblage (breeding).	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M7, M8	Yes
West Westray SPA	This designated site is within 2 km of the AoI	0 (directly adjacent to AoI)	• Arctic skua (breeding); • Arctic tern (*Sterna paradisaea*) (breeding); • Kittiwake (breeding); • Guillemot (breeding); • Fulmar (breeding); and • Razorbill (*Alca torda*) (breeding)	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M7, M8	Yes
Auskerry SPA	This designated site is within 2 km of the AoI	0.19	• · Artic tern (breeding); and • Storm petrel (*Hydrobates pelagicus*) (breeding).	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M7, M8	Yes

PROTECTED SITE	CRITERIA FOR POTENTIAL CONNECTIVITY TO THE SITE	MINIMUM DISTANCE TO PROTECTED SITE (km)[7]	RELEVANT QUALIFYING FEATURES OF DESIGNATED SITE	ACTIVITY	PROPOSED MITIGATION MEASURES	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT
Papa Westray (North Hill and Holm) SPA	This designated site is within 2 km of the AoI	1.98	• Arctic skua (breeding); and • Artic tern (breeding).	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M7, M8	Yes
Designated Seal Haul-Outs and Seal Breeding Sites						
Calf of Eday Breeding Colony Seal Haul Out	The designated site overlaps the AoI and is within 500 m of an indicative landfall location.	0 (overlaps with AoI)	• Grey seal (*Halichoerus grypus*).	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M1, M2, M3, M4, M5, M6	Yes
Deer Sound Seal Haul Out	The designated site overlaps the AoI and is within 500 m of an indicative landfall location.	0 (overlaps with AoI)	• Grey seal; and • Harbour seal (*Phoca vitulina*)..	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M1, M2, M3, M4, M5, M6	Yes
Damsay & Holm of Grimbister Seal Haul Out	The designated site overlaps the AoI and is within 500 m of an indicative landfall location.	0 (overlaps with AoI)	• Grey seal; and • Harbour seal.	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M1, M2, M3, M4, M5, M6	Yes
Holm of Rendall Seal Haul Out	The designated site overlaps the AoI and is within 500 m of an indicative landfall location.	0 (overlaps with AoI)	• Grey seal; and • Harbour seal.	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M1, M2, M3, M4, M5, M6	Yes

PROTECTED SITE	CRITERIA FOR POTENTIAL CONNECTIVITY TO THE SITE	MINIMUM DISTANCE TO PROTECTED SITE (km)[7]	RELEVANT QUALIFYING FEATURES OF DESIGNATED SITE	ACTIVITY	PROPOSED MITIGATION MEASURES	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT
Costa & Burgar Seal Haul Out	The designated site overlaps the AoI and is within 500 m of an indicative landfall location.	0 (overlaps with AoI)	• Grey seal; and • Harbour seal.	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M1, M2, M3, M4, M5, M6	Yes
Eynhallow & Westside Seal Haul Out	The designated site overlaps the AoI and is within 500 m of an indicative landfall location.	0 (overlaps with AoI)	• Grey seal; and • Harbour seal.	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M1, M2, M3, M4, M5, M6	Yes
Seal Skerry (Eday) Seal Haul Out	The designated site overlaps the AoI and is within 500 m of an indicative landfall location.	0 (overlaps with AoI)	• Grey seal; and • Harbour seal.	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M1, M2, M3, M4, M5, M6	Yes
SACs						
Faray and Holm of Faray SAC	This designated site is within 50 km of the AoI.	0 (overlaps with AoI)	• Grey seal.	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M1, M2, M3, M4, M5, M6	Yes
Sanday SAC	This designated site is within 50 km of the AoI.	1.0	• Harbour seal; and • Intertidal mudflats and sandflats.	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M1, M2, M3, M4, M5, M6	Yes

PROTECTED SITE	CRITERIA FOR POTENTIAL CONNECTIVITY TO THE SITE	MINIMUM DISTANCE TO PROTECTED SITE (km)[7]	RELEVANT QUALIFYING FEATURES OF DESIGNATED SITE	ACTIVITY	PROPOSED MITIGATION MEASURES	POTENTIAL FOR LIKELY SIGNIFICANT EFFECT
NCMPAs						
Wyre and Rousay Sounds NCMPA	The designated site overlaps the AoI.	0 (overlaps with AoI)	• Kelp and seaweed communities on sublittoral sediment; and • Maerl beds.	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• N/A	Yes
Papa Westray NCMPA	The designated site overlaps the AoI.	0 (directly adjacent to AoI)	• Black guillemot (*Cepphus grille*) (breeding); and • Marine geomorphology of the Scottish Shelf Seabed.	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• M7, M8	Yes
North-West Orkney NCMPA	The designated site overlaps the AoI.	0 (directly adjacent to AoI)	• Sandeels (*Ammodytes marinus* / *Ammodytes tobianus*); and • Marine Geomorphology of the Scottish Shelf Seabed.	• Vessel presence; • Geophysical surveys; • Geotechnical surveys; and • Benthic surveys	• N/A	Yes

4.2 Assessment of Impacts on Protected Sites

4.2.1 SACs and NCMPAs with Cetaceans as Qualifying Features

There are no designated sites with cetaceans as a qualifying feature within 50 km of the AoI. As such, no impacts to SACs or NCMPAs with cetaceans as a feature are anticipated.

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

There are two SACs with seal qualifying features in the vicinity of the AoI: the Faray and Holm Faray SAC designated for grey seals (0 km, direct overlap), and the Sanday SAC (1 km), designated for harbour seals.

As shown in Figure 4-1, there are six protected seal haul-out sites and one breeding seal haul out site within the AoI which are within 500 m of the indicative landfall locations. All sites are protected for both grey and harbour seals, with the exception of the Calf of Eday Breeding Colony haul out which is only designated for grey seals. The Calf of Eday Breeding Colony haul out is located at the north of Eday. To the south of Eday, the Seal Skerry (Eday) seal haul-out site is also present within proximity of an indicative landfall location. The remaining five seal haul-out sites are located in proximity of indicative landfall locations on Mainland Orkney, these are the Deer Sound, Damsay & Holm of Grimbister, Holm of Rendall, Costa & Burgar and Eynhallow & Westside seal haul-out sites.

Both harbour seals and grey seals are especially vulnerable to disturbance during their pupping and moulting seasons. For harbour seals, these sensitive periods occur from mid-June to August, while for grey seals, pupping takes place from October to December, followed by moulting in January to February. The proposed survey activities are scheduled between 20th October 2025 and 19th October 2030, meaning they may coincide with these critical periods for both grey and harbour seal.

The presence of vessels or survey activities (e.g. percussive borehole activities) in the nearshore environment very close to haul-out sites, may result in seals flushing (rapidly returning to sea) if such activities are conducted in close proximity to a haul-out site. During the breeding season, this may lead to pup abandonment or crushing by adults. If disturbance of a haul-out occurs during the moult, seals returning to the sea will be subjected to thermoregulatory stress as their fur is not in suitable condition. Therefore, disturbance of seal haul-outs may result in a reduction of fitness of seals at an individual or local population level, particularly if the disturbance occurs regularly and over multiple seasons. In order to reduce the risk of disturbance and flushing of seals during their most sensitive period, where the survey activities are being undertaken within 500 m of a designated seal haul-out or an SAC designated for the conservation of seals, SSEN Transmission will ensure that nearshore vessel-based surveys within 200 m of land are scheduled to take place outwith the breeding or moulting seasons, as detailed in Section 5.1.5 (M5). In addition, all vessels will adhere to the provisions of the Scottish Marine Wildlife Watching Code (SMWWC) during survey activities. The mitigation measures with relevance to seals are further detailed in Section 5.

There is the potential for disturbance at-sea resulting from the underwater sound emissions associated with the survey activities to the harbour seal qualifying features of the Faray and Holm Faray SAC and the Sanday SAC. The auditory bandwidth of harbour seals ranges from 75 Hz to 100 kHz (Table 3-3). The sound modelling results for injury (Table 3-6) summarise that the injury range for seals are between 1 m and 44 m for a moving animal, depending on the activity and equipment used. The results for UHRS with a frequency of 6 kHz has the largest injury range for seals. As detailed in Section 5, the JNCC marine mammal mitigation protocols will be applied for seals, and as such the proposed survey activities will not present a risk of injury to seals.

Disturbance at sea could occur during the breeding and moulting periods for harbour and grey seal when seals are most sensitive to disturbance. However, taking the short-term, temporary and transient nature of the survey works into account, only a small number of harbour and grey seal individuals are expected to be disturbed at any one time. Furthermore, as seals are mobile, they are unlikely to be exposed to extended periods of underwater sound, reducing any significant disturbance effects. Contemporary data suggests that even with very intense sound emissions, such as those from pile driving activity, seals are likely to return to the region of the sound source once the emissions have ceased, demonstrating that disturbance effects from the proposed survey activities (which have much reduced source levels compared to piling) will be short-lived (Russell *et al.*, 2016).

Considering the proposed mitigation, the temporary and transient nature of the survey works in the nearshore area, and the existing vessel activity in the region, the potential for adverse impacts to hauled out harbour and grey seals from the presence of vessels close to shore is low. The measures, as described in Section 5, will prevent injury to seals resulting from the geophysical surveys, and disturbance to seals at sea. Any disturbance effect will be highly localised, transient and temporary.

Given the above, it is concluded that there will be no Adverse Effects On Site Integrity (AEoSI) or adverse effects to the conservation objectives of the Faray and Holm Faray SAC and the Sanday SAC.

4.2.3 SPAs and NCMPAs with Birds as Qualifying Features

The North Orkney SPA, Scapa Flow SPA, Calf of Eday SPA, Copinsay SPA, Rousay SPA, West Westray SPA, and Papa Westray NCMPA overlap with or are immediately adjacent to the AoI. The Auskerry SPA and Papa Westray (North Hill and Holm) SPA are located within 2 km of the AoI. The following provides a summary of the qualifying features:

- The North Orkney SPA lies to the north of Mainland Orkney, extending from Deerness in the east and Eynhallow in the west. The site includes several large, sheltered bays, such as Ignaness Bay, Deer Sound and Bay of Firth. The site regularly supports a population of non-breeding great northern diver, Slavonian grebe and velvet scoter and also breeding red-throated diver;
- The Scapa Flow SPA is located in Orkney, Scotland, is designated under the EU Birds Directive for its importance to seabird and waterfowl populations. The site is particularly significant for supporting internationally important numbers of great northern divers, slavonian grebes, and long-tailed ducks during the non-breeding season. These species rely on the sheltered, nutrient-rich waters of Scapa Flow for feeding and roosting. The SPA plays a crucial role in the conservation of these migratory birds by providing a safe and productive marine environment;
- The Calf of Eday SPA is a small maritime island to the north of Eday in Orkney and the site is characterised by a rocky shoreline with cliffs to the north and west. The site extends approximately 2 km into the marine environment. The site has been designated for breeding colonies of cormorant, fulmar, great black-backed gull, guillemot and kittiwake;
- The Copinsay SPA comprises a group of islands 4 km off the east coast of Mainland Orkney. The islands cliffed rocky coastline and vegetation supports large colonies of protected seabirds. The site contains the designated features fulmar, great black-backed gull, guillemot and kittiwake, which utilise the site for breeding;
- The Rousay SPA consists of sea cliffs and areas of maritime heath and grasslands in the northwest and north east of an island off the north-east coast of Mainland Orkney. The site supports colonies of breeding seabirds, including designated features Arctic skua and Arctic tern;
- The West Westray SPA is designated for its importance to breeding seabirds and supports internationally significant populations of Arctic terns and common guillemots, among other species. These cliffs and coastal habitats provide essential nesting and foraging areas, contributing to the conservation of seabird biodiversity in

the North Atlantic. The SPA also includes adjacent marine waters that are critical for feeding during the breeding season;

- Papa Westray NCMPA, located off the coast of Orkney, Scotland, is designated to protect important breeding population of black guillemot;
- Papa Westray (North Hill and Holm) SPA is designated for its significance to breeding seabirds and waders. The site is especially important for supporting internationally important populations of Arctic terns and Arctic skuas, which rely on the coastal grasslands and moorland for nesting. The surrounding marine and intertidal areas also provide essential feeding grounds, making this SPA a key site for the conservation of these migratory bird species; and
- The Auskerry SPA is located within the small low-lysing island of Auskerry, which is situated 5 km south of Stronsay in the Orkney archipelago. The shoreline within the site boundary is characterised by a mixture of rocky platforms interspersed with low cliffs and boulder/ shingle beaches. The site has been designated for the breeding colonies of Artic stern and storm petrel.

The presence of vessels may cause direct disturbance or displacement of birds. Additionally, vessel lighting can disorient fledgling birds, potentially increasing the risk of night-time collisions with vessels, which may be fatal (Rodriguez *et al.*, 2015). 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 proposed survey activities is expected to be temporary, transient, and restricted to the immediate vicinity of the survey vessels. This minimises the likelihood of disturbance at key breeding or non-breeding sites for the qualifying features of the SPAs, whether within or up to 2 km from the AoI. In addition, given the moderate vessel traffic in the region, the presence of a small number of slow-moving survey vessels is not considered to be a material change from baseline conditions

Although disturbance remains a possibility, the potential effects on the qualifying avian features of the SPAs will be temporary and of localised nature and will further be reduced by the other embedded mitigation measures detailed in Section 5.2, including adhering to the SMWWC, slow moving vessels and lighting restrictions during night-time working. Therefore, it is concluded that there will be no AEoSI or adverse effects to the conservation objectives of the SPAs listed above, and the Papa Wstray NCMPA will not be adversely affected, other than insignifncantly.

4.2.4 SACs and NCMPAs with Otters as Qualifying Features

There are no designated sites with otters as a qualifying feature with sea connectivity within 500 m of the AoI. As such, no impacts to SACs or NCMPAs with otters as a feature are anticipated. However, precautionary mitigations for otters will still be applied due to their mobility and ecological importance in areas such as Orkney as detailed in Section 5.3.

4.2.5 SACs and NCMPAs with Benthic Qualifying Features

The AoI overlaps the Wyre and Rousay Sounds NCMPA, and is adjacent to the North-West Orkney NCMPA and the Papa Westray NCMPA, which support important benthic qualifying features.

The Wyre and Rousay Sounds NCMPA is situated between the islands of Rousay, Wyre, and Egilsay, near the boundary between the Atlantic Ocean and the North Sea. This site is designated for its kelp and seaweed communities on sublittoral sediment, as well as maerl beds. The North-West Orkney NCMPA, located off the north and west coasts of Orkney on the Scottish continental shelf, is designated for sandeels, sandbanks, sandwave fields, and sediment

wave fields—features representative of the Fair Isle Strait Marine Process Bedforms Key Geodiversity Area. The Papa Westray NCMPA is designated in part due to its geomorphological features, including glacially influenced seabed formations, and for supporting marine biodiversity such as kelp forests, maerl beds, and burrowed mud habitats.

The proposed survey activities with potential seabed interaction include benthic sediment sampling, vibrocoring with PCPT, geotechnical boreholes, and the temporary deployment of jack-up vessels associated with geotechnical borehole drilling. The volume of sediment to be extracted is expected to be minimal, and video inspections will be conducted prior to sampling to avoid sensitive features wherever practicable. As such, impacts on sensitive habitats and geological features are expected to be avoided or minimised.

Given the AoI does not overlap with the Papa Westray NCMPA or the North-West Orkney NCMPA, no sampling will take place within these sites, and hence there is no ecological connectivity between the proposed survey activities and the qualifying features of these sites. As such these sites will not be adversely affected.

No landfalls are planned within the Wyre and Rousay Sounds NCMPA, and as such geotechnical boreholes (and associated use of jack up barges) will not be conducted within this site. As such the only potential survey activities which may affect the benthic qualifying features of this site are PCPT, vibrocoring and benthic grab sampling. The footprint of these activities will be limited in be extremely limited in spatial extent.

Given that sensitive benthic features will be avoided during seabed sampling, the proposed survey activities are not cable of affecting, other than insignificantly, the Wyre and Rousay Sounds NCMPA.

4.3 In-combination Effects

As mentioned in Section 3.6, there are assets located within the AoI and two planned assets that could potentially contribute to in-combination effects on the qualifying features of the designated sites identified in Section 4.1 above. However, any disturbance to these features, as listed in Table 4-1, is expected to be highly spatially and temporally limited. Consequently, the survey activities are not anticipated to significantly increase the likelihood of LSE on the designated sites. Therefore, no in-combination effects are anticipated.

4.4 Conclusion

The AoI overlaps with or is immediately adjacent to:

- North Orkney SPA: designated for breeding red-throated diver and non-breeding great northern diver, Slavonian grebe, and velvet scoter;
- Scapa Flow SPA: designated for breeding red-throat diver and non-breeding black-throated diver, eider, great northern diver, long-tailed duck, red-breasted merganser, shag, slavonian grebe (non-breeding);
- Calf of Eday SPA: designated for breeding cormorant, fulmar, great black-backed gull, guillemot, kittiwake, and seabird assemblage;
- Copinsay SPA: designated for breeding fulmar, great black-backed gull, guillemot, kittiwake, and seabird assemblage;
- Rousay SPA: designated for breeding Arctic skua, Arctic tern, kittiwake, guillemot, fulmar, and razorbill;
- West Westray SPA: designated for breeding Arctic skua, Arctic tern, kittiwake, guillemot, fulmar, and razorbill;
- Farray & Holm of Faray SAC: designated for grey seal;
- Wyre and Rousay Sounds NCMPA: designated for Kelp and seaweed communities on sublittoral sediment; and maerl beds;

- Papa Westry NCMPA: designated for breeding black guillemot and marine geomorphology of the Scottish Shelf Seabed; and
- North-West Orkney NCMPA: designated for sandeel and marine geomorphology of the Scottish Shelf Seabed.

The AoI also lies within 500 m of the Auskerry SPA, designated for breeding Arctic tern and storm petrel, around 2 km from the Papa Westray (North Hill and Holm) SPA, designated for Arctic skua and Arctic tern, and 1 km from the Sanday SAC, designated for harbour seal. The potential landfall areas withing the AoI also lie less than 500 m of seven designated seal haul out sites.

No injurious impacts are expected to result from the survey activities to the qualifying features of the Farray & Holm of Faray SAC, and the implementation of the mitigation measures presented in Section 5 will further reduce this risk. Considering the temporary and localised nature of the survey works and the intervening distance between the Sanday SAC it is concluded that there will be no AEoSI of the Farray & Holm of Faray SAC and the Sanday SAC. Residual impacts will be limited to disturbance of individuals. In order to reduce the risk of disturbance and flushing of seals during moulting and breeding period, SSEN Transmission will adhere to the mitigation measures with relevance to seals are further detailed in Section 5.

There is potential for the breeding and non-breeding bird qualifying feature of the SPAs which overlap with or are adjacent to the AoI to be disturbed. However, any disturbance to birds will be localised and temporary, and it is concluded that there will be no AEoSI for the North Orkney SPA, Scapa Flow SPA, Calf of Eday SPA, Copinsay SPA, Rousay SPA, West Westray SPA.

The Wyre and Rousay Sounds NCMPA, Papa Westray NCMPA, and North-West Orkney NCMPA overlap with or are adjacent to the AoI, therefore there is potential for adverse effects on the features of these NCMPAs. However, given the localised and transient nature of the proposed survey activities combined with the mitigation measures detailed in Section 5, it is concluded that the NCMPAs are not expected to be adversely affected, other than insignifncantly.

Due to the temporary and localised nature of the proposed activities within the overall survey window, no AEoSI are anticipated for any protected site and the survey works are not anticipated to hinder the achievement of the Conservation Objectives of any protected site, with no potential for significant in-combination 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 (SMWWC) (NatureScot, 2017a), Basking Shark Code of Conduct (Shark Trust, 2024) and Guide to Best Practice for Watching Marine Wildlife (NatureScot, 2017b);
- All vessels will adhere to the provisions of the Basking Shark Code of Conduct (Shark Trust, 2024);
- If the SBP or LFE 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
- 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 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 Passive Acoustic Monitoring (PAM) system to detect for the presence of cetaceans that cannot be detected by the MMO;
- 500 m mitigation zone for cetaceans. If UHRS at 0.1 kHz is operated this will be increased to 600 m;
- The mitigation zone shall be centreed on the SBP or UHRS device, e.g, if the SBP or UHRS is deployed on an ROV or towered equipment, this will be the centre of the mitigation zone, and not the survey vessel;
- The mitigation zone for seals will be reduced to 200 m in the event of a need to avoid critical delay to the project and will be agreed with MD-LOT; 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 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.

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 - Protected Seal Haul-out Site

During hours of darkness and in poor visibility when the MMO cannot monitor for the visibility of seals, the equipment must not be deployed or started within 100 m of any SAC designated for the conservation of seals or a designated seal-haul out site. The SBP and UHRS must be started outwith this distance, and the vessel the moved in to position once the SBP and UHRS is sounding.

Where the survey activities are being undertaken within 500 m of a designated seal haul-out or SAC designated for the conservation of seals; SSEN Transmission will ensure that nearshore vessel-based surveys within 200 m of land are scheduled to take place outwith the breeding or moulting seasons for the relevant seal species. Specifically, the periods that will be avoided are:

- Grey seal sites:
  - 15th September – 15th November (inclusive) for the breeding season; and
  - 1st December – 31st January (inclusive) for the moult.
- Harbour seal sites:
  - 15th June – 31st August (inclusive) for the breeding season and moult.

If the MMO confirms that no seals are hauled out onshore inside a designated haul out or SAC such that they would be within 200 m of the vessel; the above seasonal restrictions shall not apply to nearshore survey operations, and the surveys will be permitted to continue.

5.1.6 M6 – 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 requirement will be communicated to the MMOs at project start up meetings and at crew change.

5.2 Seabirds

The following mitigation measures will be implemented in order to reduce disturbance to seabirds:

5.2.1 M7 – Rafting Seabirds

The survey vessels will be moving at a maximum speed of 6 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 it is safe to do so.

5.2.2 M8 – Light Disturbance

When within an SPA and where there is potential for 24 hours 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;
- 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 marine SPAs.

5.3 Otters

As outlined in Section 4.2.4, there are no designated sites within 500 m of the AoI with otter designated features. However, due to the mobile nature of otters, and the importance of the Orkney islands for this species, the following mitigation measures will be implemented in order to reduce disturbance to otters:

5.3.1 M9 – Otter Monitoring

There will be MMO coverage for the duration of the vessel based 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 see Section 5.1.2).

5.3.2 M10 – Otter Mitigation zone

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

5.4 Basking Sharks

5.4.1 Basking Shark Monitoring

As outlined in Section 5.1.1, 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. 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.

5.4.2 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.

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 AoI overlaps with or is in close proximity to several protected sites, including two SACs, three NCMPAs, and six SPAs. 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

Blix, A.S. and Folkow, L. 1995. Daily energy requirements in free living minke whales. Acta Physiol. Scand. 153: 61-66.

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.

Hague, E.L., Sinclair, R.R., Sparling, C.E. 2020. Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters. *Scottish Marine and Freshwater Series*. Vol 11 No 12.

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.

IAMMWG. 2023. Review of Management Unit boundaries for cetaceans in UK waters. Available online at: https://data.jncc.gov.uk/data/b48b8332-349f-4358-b080-b4506384f4f7/jncc-report-734.pdf [Accessed: 5/05/2025].

JNCC. 2017. JNCC guidelines for minimising the risk of injury and disturbance to marine mammals from geophysical surveys. April 2017.

JNCC. 2020. Guidance for assessing the significance of noise disturbance against Conservation Objectives of harbour porpoise SACs (England, Wales & Northern Ireland). JNCC Report No. 654, JNCC, Peterborough. Available online at: https://data.jncc.gov.uk/data/2e60a9a0-4366-4971-9327-2bc409e09784/JNCC-Report-654-FINAL-WEB.pdf [Accessed: 8/05/2025]. .

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.

National Marine plan Interactive (NMPI) Marine Scotland. 2025. NMPi. Available online at : https://marinescotland.atkinsgeospatial.com/nmpi/ [Accessed: 6/05/2025].

Marine Scotland, 2021. Information Note and Frequently Asked Questions for the Operators of Finfish Farms on the use of Acoustic Deterrent Devices and the Requirement for a European Protected Species Licence. Available at: https://marine.gov.scot/sites/default/files/faq_adds_and_eps_including_annex_1_and_annex_2_-_version_5_-_october_2021_-_final.pdf

Marsh, H.W. and Schulkin, M., 1962. Shallow-water transmission. The Journal of the Acoustical Society of America, 34, 863-864.

NatureScot. 2016. Guidance Note: Assessing collision risk between underwater turbines and marine wildlife. Available online at: https://www.nature.scot/sites/default/files/2022-08/Final%20-%20Guidance%20Note%20-%20Assessing%20collision%20risk%20between%20underwater%20turbines%20and%20marine%20wildlife.pdf [Accessed 8/05/2025].

NatureScot. 2017a. Scottish Marine Wildlife Watching Code. Available online at: https://www.nature.scot/doc/scottish-marine-wildlife-watching-code-smwwc-part-1 [Accessed 8/05/2025].

NatureScot. 2017b. A Guide to Best Practice for Watching Marine Wildlife. Available online at: 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: 8/05/2025].

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 8/05/2025].

NatureScot. 2023. Minke whale. Available online at: https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals/minke-whale [Accessed 8/05/2025].

NatureScot. 2025. Marine mammals. Available online at: https://www.nature.scot/plants-animals-and-fungi/mammals/marine-mammals#:~:text=Seven%20of%20these%20are%20relatively,coast%20in%20internationally%20important%20numbers. [Accessed 6/05/2025].

NMFS (National Marine Fisheries Service). 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: 4672-4673.

NOAA (National Oceanic and Atmospheric Administration). 2018. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing, Technical Memorandum NMFS-OPR-55, 2018.

Orkney Islands Council (2020). State of the Environment Assessment. A baseline assessment of the Orkney Islands Marine Region. Available online at: https://www.orkney.gov.uk/media/tqci4oog/20210107-oic-report-v9-screen-v2.pdf[Accessed 8/05/2025].

Otani, S., Naito, Y., Kato, A. and Kawamura, A. (2000). Diving behavior and swimming speed of a free-ranging harbor porpoise, Phocoena. Marine Mammal Science, 16, 811-814.

Paxton, C.G.M., Scott-Hayward, L.A.S. & Rexstad, E. 2014. Statistical approaches to aid the identification of Marine Protected Areas for minke whale, Risso's dolphin, white-beaked dolphin and basking shark. Scottish Natural Heritage Commissioned Report No. 594.

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.

Russell, D.J., Hastie, G.D., Thompson, D., Janik, V.M., Hammond, P.S., Scott-Hayward, L.A., Matthiopoulos, J., Jones, E.L. and McConnell, B.J. 2016. Avoidance of wind farms by harbour seals is limited to pile driving activities. Journal of Applied Ecology, 53, 1642-1652.

Shark Trust (2024). Basking Shark Code of Conduct. Available online at: https://www.sharktrust.org/Handlers/Download.ashx?IDMF=6137b1a1-8518-4327-9922-7b280acb8336 [Accessed 8/05/2025].

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, Academic Press, Volume 54 (2008).

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(4); Special Issue.

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.

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.

Whale and Dolphin Conservation (WDC). 2025. Harbour porpoise (*Phocoena phocoena*). Available online at: https://uk.whales.org/whales-dolphins/species-guide/harbour-porpoise/ [Accessed 8/05/2025].

WDC. 2025. White-beaked dolphin (*Lagenorhynchus albirostris*). Available online at: https://uk.whales.org/whales-dolphins/species-guide/white-beaked-dolphin/ [Accessed 8/05/2025].

Williams, T.M. 2009. Encyclopedia of Marine Mammals 1140-47. ed Perrin, W.F., Würsig, B. and Thewissen, J.G.M. Academic Press (2009).

Witt MJ, Hardy T, Johnson L, McClellan CM and others (2012) Basking sharks in the northeast Atlantic: spatio-temporal trends from sightings in UK waters. Mar Ecol Prog Ser 459:121-134. https://doi.org/10.3354/meps09737

APPENDIX A AREA OF INTEREST 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
59° 8' 58.54 N	3° 11' 29.52 W	59° 8.975' N	3° 11.491' W	59.1496	-3.19153
59° 9' 9.45 N	3° 14' 17.11 W	59° 9.157' N	3° 14.285' W	59.15263	-3.23809
59° 8' 16.68 N	3° 17' 35.40 W	59° 8.278' N	3° 17.590' W	59.13797	-3.29317
59° 8' 51.74 N	3° 21' 9.15 W	59° 8.862' N	3° 21.153' W	59.14771	-3.35254
59° 15' 17.30 N	3° 22' 4.63 W	59° 15.288' N	3° 22.077' W	59.25481	-3.36795
59° 18' 11.12 N	3° 18' 35.90 W	59° 18.185' N	3° 18.598' W	59.30309	-3.30997
59° 28' 38.19 N	2° 59' 28.63 W	59° 28.636' N	2° 59.477' W	59.47728	-2.99129
59° 28' 44.10 N	2° 39' 0.41 W	59° 28.735' N	2° 39.007' W	59.47892	-2.65011
59° 24' 35.37 N	2° 39' 12.37 W	59° 24.589' N	2° 39.206' W	59.40982	-2.65344
59° 22' 54.07 N	2° 38' 0.01 W	59° 22.901' N	2° 38.000' W	59.38169	-2.63334
59° 16' 9.98 N	2° 39' 46.76 W	59° 16.166' N	2° 39.779' W	59.26944	-2.66299
59° 12' 28.19 N	2° 42' 9.80 W	59° 12.469' N	2° 42.163' W	59.20783	-2.70272
59° 6' 52.41 N	2° 40' 25.24 W	59° 6.873' N	2° 40.421' W	59.11456	-2.67368
59° 4' 45.52 N	2° 41' 28.16 W	59° 4.758' N	2° 41.469' W	59.07931	-2.69116
59° 1' 21.74 N	2° 34' 32.92 W	59° 1.362' N	2° 34.549' W	59.02271	-2.57581
58° 55' 54.49 N	2° 28' 16.06 W	58° 55.908' N	2° 28.268' W	58.9318	-2.47113
58° 50' 14.07 N	2° 29' 40.70 W	58° 50.235' N	2° 29.678' W	58.83724	-2.49464
58° 48' 59.70 N	2° 31' 58.95 W	58° 48.994' N	2° 31.982' W	58.81658	-2.53304
58° 48' 30.61 N	2° 36' 19.16 W	58° 48.510' N	2° 36.319' W	58.8085	-2.60532
58° 49' 28.27 N	2° 46' 46.69 W	58° 49.471' N	2° 46.778' W	58.82452	-2.77964
58° 50' 50.87 N	2° 49' 3.45 W	58° 50.848' N	2° 49.057' W	58.84746	-2.81763
58° 53' 10.05 N	2° 49' 19.70 W	58° 53.168' N	2° 49.328' W	58.88613	-2.82214
58° 54' 52.60 N	2° 47' 8.23 W	58° 54.877' N	2° 47.137' W	58.91461	-2.78562
58° 54' 47.33 N	2° 45' 43.60 W	58° 54.789' N	2° 45.727' W	58.91315	-2.76211
58° 55' 23.97 N	2° 44' 51.24 W	58° 55.399' N	2° 44.854' W	58.92333	-2.74757
58° 55' 14.06 N	2° 42' 30.22 W	58° 55.234' N	2° 42.504' W	58.92057	-2.7084

[8] *Landward boundaries of the AoI in the indicative landfall areas are defined by MHWS.*

COORDINATES FOR THE SURVEY AREA (WGS 84)[8]					
58° 56' 14.11 N	2° 43' 6.03 W	58° 56.235' N	2° 43.101' W	58.93725	-2.71834
58° 57' 53.55 N	2° 42' 3.38 W	58° 57.893' N	2° 42.057' W	58.96488	-2.70094
58° 58' 23.31 N	2° 42' 26.16 W	58° 58.388' N	2° 42.436' W	58.97314	-2.70727
58° 56' 40.03 N	2° 48' 44.94 W	58° 56.667' N	2° 48.750' W	58.94445	-2.81248
58° 56' 26.44 N	2° 47' 14.58 W	58° 56.441' N	2° 47.243' W	58.94068	-2.78738
58° 55' 36.71 N	2° 47' 34.80 W	58° 55.612' N	2° 47.580' W	58.92687	-2.793
58° 55' 31.34 N	2° 46' 44.44 W	58° 55.522' N	2° 46.741' W	58.92537	-2.77901
58° 54' 58.20 N	2° 47' 18.15 W	58° 54.970' N	2° 47.302' W	58.91617	-2.78837
58° 55' 22.95 N	2° 48' 17.96 W	58° 55.383' N	2° 48.299' W	58.92304	-2.80499
58° 55' 44.77 N	2° 48' 3.61 W	58° 55.746' N	2° 48.060' W	58.9291	-2.801
58° 55' 32.37 N	2° 50' 9.85 W	58° 55.539' N	2° 50.164' W	58.92566	-2.83607
58° 56' 39.74 N	2° 49' 34.96 W	58° 56.662' N	2° 49.583' W	58.94437	-2.82638
58° 57' 28.54 N	2° 50' 50.60 W	58° 57.476' N	2° 50.843' W	58.95793	-2.84739
58° 57' 59.02 N	2° 49' 11.14 W	58° 57.984' N	2° 49.186' W	58.9664	-2.81976
58° 57' 55.42 N	2° 47' 30.96 W	58° 57.924' N	2° 47.516' W	58.96539	-2.79193
58° 59' 36.06 N	2° 48' 10.29 W	58° 59.601' N	2° 48.171' W	58.99335	-2.80286
58° 58' 53.92 N	2° 49' 33.35 W	58° 58.899' N	2° 49.556' W	58.98164	-2.82593
58° 59' 12.79 N	2° 51' 23.18 W	58° 59.213' N	2° 51.386' W	58.98689	-2.85644
58° 57' 40.14 N	2° 53' 17.43 W	58° 57.669' N	2° 53.290' W	58.96115	-2.88818
58° 57' 50.76 N	2° 54' 55.20 W	58° 57.846' N	2° 54.920' W	58.9641	-2.91534
58° 58' 42.45 N	2° 55' 14.52 W	58° 58.708' N	2° 55.242' W	58.97846	-2.9207
58° 59' 27.02 N	2° 53' 17.18 W	58° 59.450' N	2° 53.286' W	58.99084	-2.88811
58° 59' 34.90 N	2° 54' 55.83 W	58° 59.582' N	2° 54.931' W	58.99303	-2.91551
59° 0' 37.65 N	2° 54' 2.21 W	59° 0.628' N	2° 54.037' W	59.01046	-2.90061
59° 0' 24.34 N	2° 55' 37.25 W	59° 0.406' N	2° 55.621' W	59.00676	-2.92701
59° 0' 55.12 N	2° 55' 59.16 W	59° 0.919' N	2° 55.986' W	59.01531	-2.9331
58° 59' 8.82 N	2° 57' 51.99 W	58° 59.147' N	2° 57.867' W	58.98578	-2.96444
59° 0' 2.02 N	2° 58' 34.51 W	59° 0.034' N	2° 58.575' W	59.00056	-2.97625
59° 0' 36.45 N	3° 0' 25.00 W	59° 0.608' N	3° 0.417' W	59.01013	-3.00695
59° 0' 32.07 N	3° 2' 26.44 W	59° 0.535' N	3° 2.440' W	59.00891	-3.04068

COORDINATES FOR THE SURVEY AREA (WGS 84)[8]					
58° 59' 36.59 N	3° 3' 12.67 W	58° 59.610' N	3° 3.212' W	58.9935	-3.05352
59° 0' 15.56 N	3° 6' 41.10 W	59° 0.259' N	3° 6.685' W	59.00432	-3.11142
59° 0' 38.74 N	3° 6' 46.42 W	59° 0.646' N	3° 6.774' W	59.01076	-3.11289
59° 1' 24.70 N	3° 4' 54.07 W	59° 1.412' N	3° 4.901' W	59.02353	-3.08169
59° 1' 24.78 N	3° 3' 40.16 W	59° 1.413' N	3° 3.669' W	59.02355	-3.06116
59° 2' 54.38 N	3° 3' 26.12 W	59° 2.906' N	3° 3.435' W	59.04844	-3.05725
59° 2' 19.74 N	3° 0' 42.53 W	59° 2.329' N	3° 0.709' W	59.03882	-3.01181
59° 4' 19.43 N	3° 0' 14.70 W	59° 4.324' N	3° 0.245' W	59.07207	-3.00408
59° 5' 45.80 N	3° 3' 42.21 W	59° 5.764' N	3° 3.704' W	59.09606	-3.06173
59° 6' 18.12 N	3° 2' 44.56 W	59° 6.302' N	3° 2.743' W	59.10503	-3.04571
59° 7' 26.36 N	3° 4' 17.93 W	59° 7.439' N	3° 4.299' W	59.12399	-3.07165
59° 7' 9.55 N	3° 5' 39.29 W	59° 7.159' N	3° 5.655' W	59.11932	-3.09425
59° 8' 58.54 N	3° 11' 29.52 W	59° 8.976' N	3° 11.492' W	59.1496	-3.19153
59° 13' 50.13 N	2° 44' 33.09 W	59° 13.836' N	2° 44.551' W	59.23059	-2.74252
59° 13' 54.85 N	2° 42' 55.17 W	59° 13.914' N	2° 42.920' W	59.2319	-2.71533
59° 14' 55.61 N	2° 44' 13.96 W	59° 14.927' N	2° 44.233' W	59.24878	-2.73721
59° 14' 30.61 N	2° 44' 55.73 W	59° 14.510' N	2° 44.929' W	59.24184	-2.74882
59° 13' 50.13 N	2° 44' 33.09 W	59° 13.836' N	2° 44.551' W	59.23059	-2.74252
59° 7' 37.16 N	2° 57' 16.23 W	59° 7.620' N	2° 57.271' W	59.12699	-2.95451
59° 6' 46.48 N	3° 0' 47.21 W	59° 6.775' N	3° 0.7869' W	59.11291	-3.01311
59° 6' 35.96 N	2° 57' 58.31 W	59° 6.599' N	2° 57.972' W	59.10999	-2.9662
59° 7' 1.52 N	2° 57' 1.53 W	59° 7.025' N	2° 57.026' W	59.11709	-2.95043
59° 7' 37.16 N	2° 57' 16.23 W	59° 7.619' N	2° 57.271' W	59.12699	-2.95451
58° 54' 24.85 N	2° 42' 31.38 W	58° 54.414' N	2° 42.523' W	58.9069	-2.70872
58° 53' 33.47 N	2° 42' 46.61 W	58° 53.558' N	2° 42.777' W	58.89263	-2.71295
58° 53' 19.95 N	2° 39' 56.65 W	58° 53.332' N	2° 39.944' W	58.88888	-2.66574
58° 54' 11.32 N	2° 39' 41.35 W	58° 54.189' N	2° 39.689' W	58.90315	-2.66149
58° 54' 24.85 N	2° 42' 31.38 W	58° 54.414' N	2° 42.523' W	58.9069	-2.70872
59° 5' 41.22 N	2° 57' 18.78 W	59° 5.687' N	2° 57.313' W	59.09478	-2.95522
59° 5' 19.21 N	2° 57' 40.06 W	59° 5.320' N	2° 57.667' W	59.08867	-2.96113

COORDINATES FOR THE SURVEY AREA (WGS 84)[8]					
59° 5' 12.73 N	2° 59' 40.23 W	59° 5.212' N	2° 59.670' W	59.08687	-2.99451
59° 4' 16.57 N	2° 58' 28.09 W	59° 4.276' N	2° 58.468' W	59.07127	-2.97447
59° 4' 15.51 N	2° 57' 2.54 W	59° 4.258' N	2° 57.042' W	59.07097	-2.95071
59° 4' 48.96 N	2° 56' 31.96 W	59° 4.816' N	2° 56.533' W	59.08027	-2.94221
59° 5' 41.22 N	2° 57' 18.78 W	59° 5.687' N	2° 57.313' W	59.09478	-2.95522
59° 8' 18.23 N	2° 54' 58.59 W	59° 8.304' N	2° 54.976' W	59.1384	-2.91627
59° 9' 50.09 N	2° 54' 22.98 W	59° 9.835' N	2° 54.383' W	59.16392	-2.90638
59° 10' 14.12 N	2° 56' 6.62 W	59° 10.235' N	2° 56.111' W	59.17059	-2.93517
59° 9' 16.15 N	2° 56' 48.54 W	59° 9.269' N	2° 56.809' W	59.15449	-2.94682
59° 7' 26.74 N	2° 55' 14.27 W	59° 7.446' N	2° 55.238' W	59.12409	-2.92063
59° 8' 18.23 N	2° 54' 58.59 W	59° 8.304' N	2° 54.976' W	59.1384	-2.91627
59° 14' 59.49 N	2° 45' 18.16 W	59° 14.992' N	2° 45.303' W	59.24986	-2.75505
59° 14' 4.91 N	2° 47' 25.83 W	59° 14.082' N	2° 47.431' W	59.2347	-2.79051
59° 11' 23.30 N	2° 46' 48.20 W	59° 11.388' N	2° 46.803' W	59.18981	-2.78006
59° 11' 0.15 N	2° 48' 10.09 W	59° 11.003' N	2° 48.168' W	59.18338	-2.8028
59° 11' 40.67 N	2° 49' 24.40 W	59° 11.678' N	2° 49.407' W	59.19463	-2.82344
59° 11' 16.46 N	2° 49' 39.79 W	59° 11.274' N	2° 49.663' W	59.1879	-2.82772
59° 10' 16.94 N	2° 49' 25.30 W	59° 10.282' N	2° 49.422' W	59.17137	-2.82369
59° 9' 35.83 N	2° 47' 39.62 W	59° 9.597' N	2° 47.660' W	59.15995	-2.79434
59° 8' 17.03 N	2° 47' 17.55 W	59° 8.284' N	2° 47.292' W	59.13806	-2.78821
59° 8' 51.49 N	2° 44' 20.43 W	59° 8.858' N	2° 44.340' W	59.14764	-2.73901
59° 9' 35.36 N	2° 45' 27.41 W	59° 9.589' N	2° 45.457' W	59.15982	-2.75762
59° 11' 30.32 N	2° 45' 58.31 W	59° 11.505' N	2° 45.972' W	59.19176	-2.7662
59° 11' 47.31 N	2° 45' 9.54 W	59° 11.788' N	2° 45.159' W	59.19647	-2.75265
59° 12' 33.47 N	2° 45' 24.04 W	59° 12.557' N	2° 45.401' W	59.20929	-2.75668
59° 13' 4.95 N	2° 44' 1.74 W	59° 13.082' N	2° 44.029' W	59.21804	-2.73382
59° 13' 54.49 N	2° 45' 46.20 W	59° 13.908' N	2° 45.770' W	59.23181	-2.76283
59° 14' 59.49 N	2° 45' 18.16 W	59° 14.992' N	2° 45.303' W	59.24986	-2.75505
59° 5' 17.72 N	2° 48' 9.71 W	59° 5.295' N	2° 48.162' W	59.08826	-2.8027
59° 4' 38.65 N	2° 50' 28.60 W	59° 4.644' N	2° 50.477' W	59.0774	-2.84128

COORDINATES FOR THE SURVEY AREA (WGS 84)[8]					
59° 3' 57.26 N	2° 50' 20.63 W	59° 3.954' N	2° 50.344' W	59.06591	-2.83907
59° 3' 26.43 N	2° 51' 23.69 W	59° 3.441' N	2° 51.395' W	59.05734	-2.85658
59° 3' 42.90 N	2° 53' 17.06 W	59° 3.715' N	2° 53.284' W	59.06192	-2.88807
59° 4' 40.64 N	2° 54' 12.64 W	59° 4.677' N	2° 54.211' W	59.07796	-2.90351
59° 1' 47.13 N	2° 56' 6.78 W	59° 1.785' N	2° 56.113' W	59.02976	-2.93522
59° 1' 42.14 N	2° 54' 36.32 W	59° 1.702' N	2° 54.605' W	59.02837	-2.91009
59° 2' 5.24 N	2° 54' 5.66 W	59° 2.087' N	2° 54.094' W	59.03479	-2.90157
59° 1' 7.09 N	2° 49' 26.68 W	59° 1.118' N	2° 49.445' W	59.01864	-2.82408
59° 1' 42.59 N	2° 48' 13.59 W	59° 1.710' N	2° 48.226' W	59.0285	-2.80378
59° 2' 48.87 N	2° 49' 20.91 W	59° 2.814' N	2° 49.3484' W	59.04691	-2.82247
59° 4' 6.29 N	2° 47' 59.93 W	59° 4.105' N	2° 47.999' W	59.06842	-2.79998
59° 5' 17.72 N	2° 48' 9.72 W	59° 5.295' N	2° 48.162' W	59.08826	-2.8027
59° 7' 32.17 N	3° 2' 21.62 W	59° 7.536' N	3° 2.360' W	59.1256	-3.03934
59° 7' 33.25 N	2° 59' 55.00 W	59° 7.554' N	2° 59.917' W	59.1259	-2.99861
59° 8' 5.27 N	2° 57' 49.16 W	59° 8.088' N	2° 57.819' W	59.1348	-2.96366
59° 9' 44.85 N	2° 58' 37.39 W	59° 9.748' N	2° 58.623' W	59.16246	-2.97705
59° 10' 48.22 N	2° 57' 3.53 W	59° 10.804' N	2° 57.059' W	59.18006	-2.95098
59° 11' 18.34 N	2° 58' 7.08 W	59° 11.306' N	2° 58.118' W	59.18843	-2.96863
59° 10' 44.90 N	2° 59' 42.54 W	59° 10.748' N	2° 59.709' W	59.17914	-2.99515
59° 10' 45.67 N	3° 2' 5.14 W	59° 10.761' N	3° 2.086' W	59.17935	-3.03476
59° 11' 2.40 N	3° 2' 54.04 W	59° 11.040' N	3° 2.901' W	59.184	-3.04835
59° 11' 52.50 N	3° 2' 58.71 W	59° 11.875' N	3° 2.978' W	59.19792	-3.04964
59° 12' 2.52 N	3° 4' 35.42 W	59° 12.042' N	3° 4.590' W	59.2007	-3.07651
59° 10' 23.10 N	3° 7' 11.57 W	59° 10.385' N	3° 7.193' W	59.17308	-3.11988
59° 9' 43.72 N	3° 7' 1.27 W	59° 9.729' N	3° 7.022' W	59.16214	-3.11702
59° 8' 15.86 N	3° 4' 45.05 W	59° 8.264' N	3° 4.751' W	59.13774	-3.07918
59° 7' 32.17 N	3° 2' 21.62 W	59° 7.536' N	3° 2.360' W	59.1256	-3.03934
59° 24' 8.76 N	2° 54' 29.50 W	59° 24.146' N	2° 54.492' W	59.40243	-2.9082
59° 21' 6.14 N	3° 3' 15.94 W	59° 21.103' N	3° 3.266' W	59.35171	-3.05443
59° 21' 6.14 N	3° 5' 15.06 W	59° 21.103' N	3° 5.251' W	59.35171	-3.08752

COORDINATES FOR THE SURVEY AREA (WGS 84)[8]					
59° 20' 2.42 N	3° 6' 50.92 W	59° 20.041' N	3° 6.849' W	59.33401	-3.11415
59° 15' 34.79 N	3° 2' 54.05 W	59° 15.580' N	3° 2.901' W	59.25966	-3.04835
59° 15' 21.60 N	2° 54' 40.76 W	59° 15.360' N	2° 54.679' W	59.256	-2.91132
59° 12' 16.70 N	2° 51' 42.03 W	59° 12.278' N	2° 51.700' W	59.20464	-2.86168
59° 12' 8.45 N	2° 49' 13.63 W	59° 12.141' N	2° 49.227' W	59.20235	-2.82045
59° 12' 48.31 N	2° 48' 45.57 W	59° 12.805' N	2° 48.759' W	59.21342	-2.81266
59° 14' 52.69 N	2° 49' 58.73 W	59° 14.878' N	2° 49.979' W	59.24797	-2.83298
59° 18' 16.71 N	2° 53' 47.68 W	59° 18.279' N	2° 53.795' W	59.30464	-2.89658
59° 20' 5.93 N	2° 49' 37.66 W	59° 20.099' N	2° 49.628' W	59.33498	-2.82713
59° 22' 29.36 N	2° 49' 49.37 W	59° 22.489' N	2° 49.823' W	59.37482	-2.83038
59° 23' 44.72 N	2° 50' 36.82 W	59° 23.745' N	2° 50.614' W	59.39576	-2.84356
59° 24' 20.31 N	2° 52' 15.04 W	59° 24.339' N	2° 52.251' W	59.40564	-2.87085
59° 24' 8.76 N	2° 54' 29.50 W	59° 24.146' N	2° 54.492' W	59.40243	-2.9082