EPS & Basking Shark Risk Assessment for Geophysical, Geotechnical & Environmental Surveys

N4 Offshore Wind Farm and Cable Corridor

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The business of sustainability

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Acronyms and Abbreviations

Name	Description
BRUV	Baited Remote Underwater Video
CES	Crown Estate Scotland
DDV	Drop Down Video
EPS	European Protected Species
ERM	Environmental Resources Management Ltd.
EU	European Union
FCS	Favourable Conservation Status
IAC	Inter Array Cables
IAMMWG	Inter-Agency Marine Mammal Working Group
MBES	Multi-beam Echo Sounder
MMO	Marine Mammal Observer
MPA	Marine Protected Area
NMPI	National Marine Plan Interactive
NPI	Northland Power Inc
PAM	Passive Acoustic Monitoring
PCPT	PiezoCone Penetration Test
PTS	Permanent Threshold Shift
SAC	Special Area of Conservation
SBP	Sub-bottom Profiler
SEL	Sound Exposure Level
SPL	Sound Pressure Level
SSS	Side Scanning Sonar
TTS	Temporary Threshold Shift
UHR	Ultra High Resolution
UK	United Kingdom
USBL	Ultra-short Baseline
UXO	Unexploded Ordnance
WFD	Water Framework Directive

1. INTRODUCTION

Northland Sheena Limited (The Company) plan to undertake a geophysical, geotechnical and environmental survey programme within the proposed N4 offshore wind farm array area and within the potential cable corridor between array area and the shore of the Isle of Lewis ("the Project"). This document has been prepared by Environmental Resources Management Ltd. (ERM) on behalf of The Company to accompany the European Protected Species (EPS) Licence application.

Marine Scotland guidance published for the protection of EPS, outlines certain construction activities (including geophysical and geotechnical surveys) associated with marine renewable energy developments as having the potential to cause disturbance, injury, or death of cetaceans (Marine Scotland, 2020a). Additionally, if an activity taking place in the Scottish Territorial Sea is likely to cause to disturbance or injury to basking sharks (*Cetorhinus maximus*), a licence is required to legally undertake that activity. Therefore, any activities planned by The Company that could potentially cause harm to an EPS or basking shark are required to obtain an EPS Licence and / or a basking shark licence to lawfully carry out the work.

1.1 Purpose of Document

The purpose of this EPS and basking shark risk assessment is to assess the potential impacts of the planned geophysical, geotechnical, and environmental survey programme (the Surveys) on EPS and basking sharks within the N4 array area and its associated cable corridor which extends from the N4 array area to the Isle of Lewis, Scotland.

1.2 Project Background

The Company is an indirect wholly owned affiliate of Northland Power Inc. (NPI) who are an experienced project developer with over 20 years working with renewable energy projects across the globe in Canada, Europe, and east Asia. The Company have been awarded the rights to develop the N4 Option Area (N4) off the Western Isles (Figure 1) by Crown Estate Scotland (CES) as part of the ScotWind 1 leasing round.

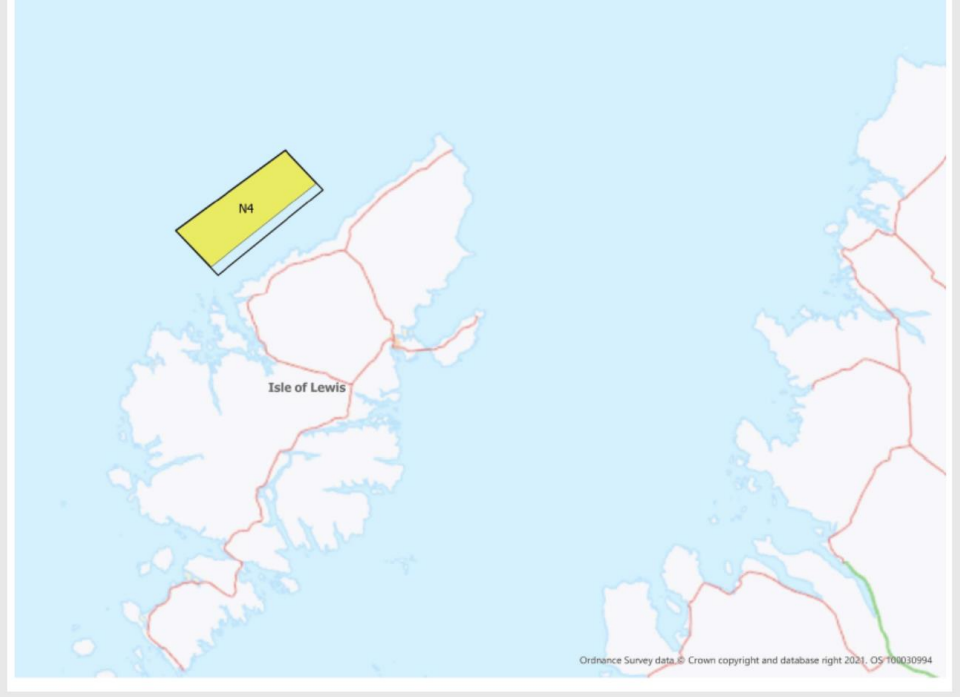

Figure 1: N4 Offshore wind farm area (yellow represents the N4 array area, black outline represents Sectoral Marine Plan option area)

The Project will consist of a fixed bottom wind farm within the N4 array area located approximately 5 km off the west coast of the Isle of Lewis at its closest point. As well as the N4 array area, there will be cables linking the array to the shore on the Isle of Lewis. The location of the landfall has not yet been fully determined; therefore it is proposed to survey the entirety of the area between the array area and the shore (as illustrated in Figure 2).

2. LEGISLATIVE BACKGROUND

2.1 European Protected Species

In Scotland, the European Habitats Directive (European Union Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora) is implemented by the Habitats Regulations 1994 (The Conservation (Natural Habitats, &c.) Regulations 1994) (as amended) (the Habitats Regulations). The Habitats Regulations provide protection of European Sites that are internationally important for threatened habitats and species and a legal framework for EPS. Annex IV of the Habitats Directive lists certain species that are strictly protected across their entire European (EU) range, the animals from Annex IV whose natural range includes any area in Great Britain are listed in Schedule 2 of the Habitats Regulations in Scotland as EPS.

Under Regulation 39 (1) of the Habitats Regulations, it is an offence to-

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

(b) Deliberately or recklessly-

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

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

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

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

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

(vi) To disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young.

Cetaceans are further protected in Scottish waters under Regulation 39 (2) of the Habitats Regulations which states that it is an offence to deliberately or recklessly disturb any dolphin, porpoise, or whale. Disturbance includes any temporary disturbance that has the potential to cause significant impact to the cetaceans present.

An EPS Licence permits activities which have the potential to disturb Cetaceans to lawfully take place under Regulation 44 (1) of the Habitats Regulations. As ‘the Project’ involves the construction of a renewable energy development, the licence is issued and authorised by Marine Scotland.

If it is determined that an activity could cause an offence under Regulation 39, it is possible to apply for an exemption to these species protection provisions, in certain specified circumstances, provided that:

- there is a licensable purpose;
- there are no satisfactory alternatives; and

- the actions authorised will not be detrimental to the maintenance of the population of the species concerned at favourable conservation status (FCS) in their natural range.

If these conditions are met, an EPS Licence can be granted to allow works to be undertaken that would otherwise cause an offence under the regulations.

2.2 Protected Fish Species

The Wildlife and Countryside Act 1981 (as amended) (the Wildlife and Countryside Act) implements the Birds Directive (EU Council Directive 2009/147/EC on the conservation of wild birds) and Bern Convention and applies to the terrestrial environment and inshore waters (up to 12 nm from land). The schedules of this Act describe the protection provided for different species. Schedule 5 gives full protection to basking sharks, vendace and powan fish species.

Under Schedule 5 of The Wildlife and Countryside Act, it is an offence to:

- intentionally or recklessly kill, injure, or take fish;
- possess or sell fish; or
- intentionally or recklessly disturb or harass fish.

The Wildlife and Natural Environment (Scotland) Act 2011 added a new licensing purpose to the Wildlife and Countryside Act, adding in section 16(3) (i) '*for any other social, economic or environmental purpose*' for certain protected species including basking sharks.

Basking sharks are further protected by the Nature Conservation (Scotland) Act 2004. Under Schedule 6 of this legislation which states it is an offence to deliberately or recklessly capture, kill, or disturb basking sharks.

Therefore, activities that are to be carried out within Scottish inshore waters must obtain a licence from Marine Scotland to undertake the work lawfully should they be likely to cause disturbance or injury to basking sharks.

3. PROPOSED SURVEYS

As part of the design evolution and environmental impact assessment process for the development of the N4 array area, and associated cable corridor, geophysical, geotechnical and environmental surveys are required to determine the seabed conditions and characterise the site.

A geophysical survey is required in order to map the seabed, measure water depth and characterise layers of sediment or rock below the seabed. A geotechnical survey is required to collect data from the seabed that will be used to confirm the data obtained from the geophysical survey and to inform cable routing, foundation design and placement of the wind turbines within the N4 array area. The environmental survey is required to map the distribution and extent of marine benthic biological communities and habitats within the Project area. These surveys are essential when undertaking any offshore wind farm development work and projects cannot be developed without this work being undertaken.

The details of the geophysical, geotechnical and environmental surveys including location, equipment and duration are described in Section 3.1.

3.1 Project and Survey Locations

3.1.1 N4 Array Area and Cable Corridor

The Project will consist of a number of fixed bottom turbines and is located approximately 5 km off the west coast of the Isle of Lewis at its closest point. Turbine foundation is currently uncertain and will be

defined following the results of ground surveys (geophysical and geotechnical) and supply chain discussions. The turbines will likely require inter array cables (IAC) and cables to link the array to the Isle of Lewis.

3.1.2 Survey Location

Figure 2 presents the location of geophysical, geotechnical and environmental surveys. The N4 Survey Area Limit (the Survey Area) is based on the array area and the cable corridor area with an additional buffer of 1 km to allow for vessel turns between transect lines, as well as covering a nearby wreck site (Canmoreld 102834) with a 500m buffer around it to allow for testing and calibration of geophysical equipment. The figure also illustrates a further 5 km buffer around the N4 Survey Area Limit, which represents the area of possible disturbance from geophysical surveys, as recommended by JNCC guidance for assessing noise disturbance (JNCC, 2020), which is based on two studies, Crocker & Fratantonio (2016) and Crocker *et al*. (2019).

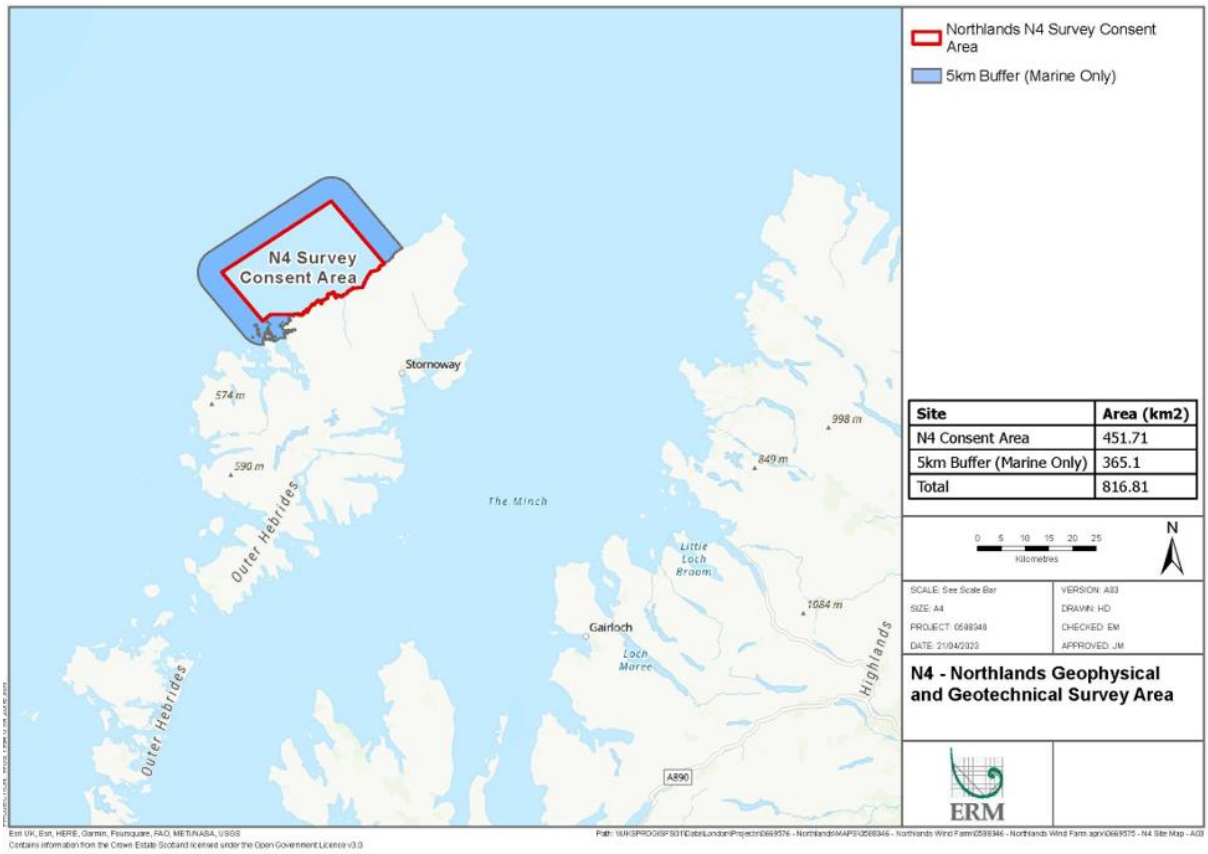

Figure 2: Location of the Survey Area

The surevy area shown in Figure 2covers an area of approximately 452 km^2 (the “Survey Area”), which includes the N4 Array Survey Area and the N4 Cable Corridor Survey Area. With the inclusion of a 5 km buffer around the Survey Area, the total potential area of disturbance is 817 km^2 (the “Area of Potential Disturbance”).

For the geotechnical and environmental survey, the specific sampling locations are not yet determined. However, they will be spread across the Survey Area so that the maximum variety of geological and geotechnical conditions and benthic habitats can be identified. The determination of the geotechnical locations will be based on the results of the geophysical survey data. The locations will also be screened by geophysical survey techniques prior to execution of geotechnical and environmental sampling activities for identification of potential hazards such as obstacles, objects, or potential for unexploded ordnance (UXO).

Coordinates of the extent of the Survey (illustrated by the N4 Survey Area Limit in Figure 2) are presented Table 1.

Table 1: Coordinates of N4 Survey Area Limit (WGS84)

Point	*Longitude*	*Latitude*
A	-6.752067	58.310227
B	-6.869893	58.306255
C	-6.896674	58.292929
D	-7.054032	58.380243
E	-6.675148	58.526129
F	-6.472149	58.413624

3.2 Equipment

3.2.1 Survey Vessels

The proposed geophysical survey will be undertaken by 1 to 3 vessels for offshore work and 1 to 2 vessels for inshore work. Offshore and inshore vessels will be equipped with the geophysical equipment described in section 3.2.2, apart from only offshore vessels being equipped with Ultra High Resolution (UHR) multichannel sub-bottom profiling equipment.

The proposed geotechnical survey will be undertaken by 1 to 2 drilling vessels with 1 in operation and a second possibly being required in order to complete work inshore and offshore. It is not expected that both vessels will be working simultaneously, however it is not excluded.

The environmental survey will be carried out by a separate contractor and use a coastal survey vessel. The survey will likely run concurrently with the geotechnical survey. Therefore, it may be possible that there are multiple vessels on site at any one time.

Specific vessel specifications are currently unavailable, however the offshore vessels are likely to be between 40 and 90 m in length and inshore vessels are likely to be 9 to 14 m in length. Inshore vessels will also have a shallower draft (approximately 1 m) to allow access to nearshore areas.

Similarly to the geophysical survey vessels, all the geotechnical and environmental survey vessels will also all be equipped with Ultra-short Baseline (USBL) equipment similar to the specifications of that shown in Table 3. Whilst it is unlikely to occur, a jack-up vessel may be proposed by the geotechnical vendor for the cable area.

Inshore vessel/s will operate from 1 m up to 20 m water depth, which may be less than approximately 1 km from shore in some instances. It should be noted that the inshore vessels will not work only in these shallow depths and they may also be used in deeper waters should they be required to support a high sea vessel during appropriate sea states. Offshore vessel/s will operate in > 10 m water depths, the exact values will be dependent on the vessel and contractor.

The vessels will possibly work simultaneously, and the offshore and inshore vessels will not be constrained to only work in the described depths. For example, if the inshore vessels have finished surveying in shallow water, the weather is good and the offshore vessels needs support, all the available vessels may be used to complete the scope of work.

3.2.2 Geophysical Survey Equipment

The surveys will require noise emitting equipment including:

- Multibeam Echo Sounder (MBES) to gather bathymetry data.
- Side Scanning Sonar (SSS) to provide information on seabed debris/features.
- USBL positioning systems and positioning transponders to monitor positioning of the remotely operated equipment.
- Sub-Bottom Profiler (SBP) systems are used to identify and measure the various marine sediment layers that exist below the sediment / water interface.

Details of example equipment is described in Table 2 and the assessment is based on a worst-case scenario.

Table 2: Summary of Example Geophysical Survey Equipment

Equipment	Operating Frequency (kHz)	Noise Level (SPL) Reported by Manufacturer (dB re. 1 µPa)
Subsea Positioning USBL		
Sonardyne Ranger USBL	35 – 50	200 (peak), 188 (rms)
Sonardyne Ranger 2 USBL HPT 3000	19 – 34	194 (peak), 188 (rms)
Sonardyne Scout	30 – 35	193 (peak)
Easytrak Nexus 2 USBL	18 – 32	198 (peak), 192 (rms)
Ix Blue GAPS	19 – 30	191 (rms)
MBES		
Reason Seabat 7125	400	220 (rms)
R2 Sonic 2024 MBES	200 – 450	229 (peak), 162 (rms)
Kongsberg EM2040C Dual Head	200 – 400	210 (peak), 204.5 (rms)
SSS		
EdgeTech 4200	100 / 600	208 – 213 (peak), 205 – 210 (rms)
Klein 3900	445 / 900	226 (peak), 220 (rms)
EdgeTech 4125-MP	400 / 900	215 (rms)
SBP		
INNOMAR SES -2000 medium – 100 Parametric sub-bottom profiler	Primary: 100 kHz (band 85 – 115 kHz) Secondary: 4, 5, 6, 8, 10, 12, 15 kHz (band 2 – 22 kHz)	>247
INNOMAR SES quattro Parametric sub-bottom profiler	Primary: 100 kHz (band 85 – 115 kHz) Secondary: 4, 5, 6, 8, 10, 12, 15 kHz (band 2 – 22 kHz)	Single beam mode >245 Quattro beam mode >235
UHR Multichannel Sub-Bottom Profiling		
Multi-electrode sparker	800-1000 J power	95 peak (85 rms)
Mini Air Gun	0.5-5 kHz (1.5 kHz primary) 10 cu. in chamber; 0.1-0.6 kHz	3.4 bar metre

3.2.3 Geotechnical Survey Equipment

The geotechnical survey will involve Piezocone Penetration Test (PCPT), borehole sampling, rock coring and the use of vibrocores. A USBL will also be required to accurately position and control the

sampling equipment as well as preventing the loss of the equipment. The USBL will be within the specifications described in Table 2.

3.2.4 Environmental Survey Equipment

The environmental survey will include a benthic survey and Water Framework Directive (WFD) sampling. These surveys will involve Drop Down Video (DDV), grab sampling using a 0.1 m^2 Hammon grab (with a Day grab/Van Veen grab as back up), a USBL for positioning (similar specifications to that shown in Table 2), water sampling (surface, mid-water and near the seabed), and Baited Remote Underwater Video (BRUV).

3.3 Duration

The geophysical survey is anticipated to be carried out for 75 days (excluding waiting on weather) in total between April 2023 and October 2023, however due to likely weather delays, geophysical survey activities may also be required in 2024. The geotechnical survey will be carried out in approximately 1 to 2 months and the environmental survey will be carried out in approximately 10-20 days. The geotechnical and environmental surveys are anticipated to occur between June and August 2023, however due to likely weather delays, geotechnical and environmental survey activities may also be required in later in 2023 and possibly into 2024. If the surveys run one after another the total number of survey days will be 155 days, however the likelihood is that the total survey days will be reduced as there will be an overlap with the geophysical, geotechnical and environmental surveys being undertaken concurrently at times.

To prepare for possible delays due to inclement weather, the EPS licence is requested to cover between April 2023 and October 2024.

4. BASELINE

4.1 Cetacean Presence

There are a range of cetaceans that inhabit the waters around Scotland, many of which have been recorded around The Western Isles coming from the Atlantic Ocean or are resident in Scotland's inshore waters. Data from Marine Scotland's National Marine Plan Interactive (NMPI), Hague, Sinclair, & Sparling, (2020), SCANS III density estimate report by Hammond *et al.* (2021), Marine Scotland (2022), MarLIN (2022), HWDT (2022), Royal Haskoning (2012) and APEM (2022), have been used to determine the presence of species that may be within the vicinity of the Project and to inform section 4.2 which gives background on the species and their distribution. Table 3 presents cetaceans which have been recorded within the vicinity of the Project along with their occurrence.

Royal Haskoning (2012) is a previous environmental statement that was prepared for the construction of a wave energy array off the coast of the Isle of Lewis. Surveys that were conducted as part of this development collected marine mammal and basking shark data from the same location that the geophysical and geotechnical surveys are proposed to be carried out. The Royal Haskoning data has been used to inform sections of this risk assessment.

Table 3: Cetaceans species likely to be present within the vicinity of the Project

Common Name	Latin Name	Occurrence
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Rare
Beaked whale spp.	All species	Sighted in the surrounding area
Bottlenose dolphin	*Tursiops truncatus*	Rare
Fin whale	*Balaenoptera physalus*	Sighted in the surrounding area
Harbour porpoise	*Phocoena phocoena*	Present year-round

Common Name	Latin Name	Occurrence
Humpback whale	*Megaptera novaeangliae*	Sighted in the surrounding area
Killer whale	*Orcinus orca*	Year-round within N4[1]
Long-finned pilot whale	*Globicephala melas*	Sighted in the surrounding area
Minke whale	*Balaenoptera acutorostrata*	Seasonal (April – October)
Risso's dolphin	*Grampus griseus*	Present year-round but peaks in summer months
Short-beaked common dolphin	*Delphinus delphis*	Seasonal (May – October)
Sperm whale	*Physeter macrocephalus*	Sighted in the surrounding area
Striped dolphin	*Stenella coeruleoalba*	Rare
White-beaked dolphin	*Lagenorhynchus albirostris*	Present year-round

Source: Hague, Sinclair, & Sparling (2020), Hammond *et al*. (2021), HWDT (2022).

Note: [1] Although they have a year-round presence in N4, due to extremely low numbers of individuals they are rarely sighted and unlikely to be within the area of the survey, therefore have not been included in the assessment.

Although all of the species in Table 3 may be present within the Survey Area, only the species that were recorded in the aerial survey in Hammond *et al.* (2021) have been further included in the assessment as this is the most up-to-date presence and density data. Therefore, killer whale, fin whale, humpback whale, Atlantic white-sided dolphin and sperm whale have not been included.

4.2 Cetacean Information

As cetaceans are mobile species there is limited data on their behaviours and distributions. Cetaceans are particularly vulnerable to disturbance and possibly injury from offshore wind pre-construction activities such as geophysical surveys due to the emission of underwater noise. As they use sound for navigation, breeding, and feeding, noise pollution can mask this or deafen the animals causing temporary and permanent impacts. Due diligence should be exercised to ensure that activities are carried out lawfully regarding EPS and their protection from disturbance and injury under the Habitats Regulations. This report forms part of that due diligence process. For each species included in the assessment, density, abundances and comparable abundances[1] are shown in Table 8.

The Company have commissioned a programme of 24 monthly digital aerial surveys, which commenced in March 2022 (APEM 2022 a,b,c,d,e,f,g). The digital aerial surveys will provide baseline information on the distribution of seabirds and marine megafauna within the vicinity of the Survey Area. Results available at the time of writing have been used to inform the baseline descriptions of cetacean presence within the vicinity of the Project and the sightings to date are summarised in Table 4.

[1] Comparable abundances from Royal Haskoning, (2012).

Table 4: Summary of Cetacean Species Recorded During the Digital Aerial Surveys

Digital Aerial Survey	No. of Cetacean Species recorded					
	Bottlenose dolphin	**Harbour porpoise**	**Risso's dolphin**	**Common dolphin**	**Minke whale**	**Dolphin/porpoise spp.**
March 2022		10	4	9		5
April 2022		5	1	1 (deceased)		
May 2022		1			1 (deceased)	
June 2022		3	11			
July 2022	1	1				
August 2022						2
September 2022		4		29		1

4.2.1 Bottlenose dolphin

The bottlenose dolphin (*Tursiops truncatus*) is present worldwide and is a common coastal species. In Scotland, it is known that a portion of the inshore bottlenose dolphin population move offshore throughout the winter months, but generally the majority of the species are present inshore often sighted around 10 km from land.

Within Scotland, bottlenose dolphins are most abundant in the northeast specifically in the Moray Firth where there is a Special Area of Conservation (SAC) designated. They have been recorded inshore northeast of the Isle of Lewis and have a presence offshore off the west coast of the Isle of Lewis.

4.2.2 Harbour porpoise

Harbour porpoise (*Phocoena phocoena*) are a very common species around all coasts of the United Kingdom (UK) and they are abundant in all Scottish waters inshore and offshore in the North Sea and North Atlantic. The Inner Hebrides and the Minches SAC is located on the west coast of Scotland, approximately 28 km southeast of the N4 array area, which is designated to protect harbour porpoise. They tend to appear in small groups rather than large pods.

The harbour porpoise has a previously known presence within the vicinity of the Project as they have been recorded by Royal Haskoning (2012) throughout the area in groups ranging from 1 individual to small pods of around 3 individuals.

Harbour porpoise are particularly sensitive to elevated noise levels and are commonly used as the most sensitive receptor when undertaking assessments of impacts on cetaceans from underwater noise from offshore wind pre-construction activities, such as geophysical surveys.

4.2.3 Minke whale

The minke whale (*Balaenoptera acutorostrata*) is mostly sighted inshore or in coastal locations. It is the most common baleen whale in Scotland and is abundant throughout Scottish waters, particularly on the west coast where the highest abundances are recorded. It is thought that the species moves into coastal waters during summer months following prey and migrates to tropical waters to breed. The Sea of the Hebrides Marine Protected Area (MPA) on the west of Scotland was designated in 2020 to protect several features including minke whales and basking sharks. The protected area is located approximately 82 km south of the N4 array area. There is also a second MPA in the northeast of Scotland designated for minke whales which is the Southern Trench MPA.

Minke whales have a previously known presence off the north-west coast of the Isle of Lewis and individuals were recorded by Royal Haskoning (2012) less than 30 km east of the Project area.

4.2.4 Risso's dolphin

Risso's dolphin (*Grampus griseus*) is found in deep water but can be sighted near shore in areas near islands or where the continental shelf is narrow. Generally, Risso's dolphin prefers tropical and warm waters and will migrate into colder northern waters during the summer. Around Scotland Risso's dolphin has been recorded down the west coast surrounding the Western Isles with the highest abundance around the north by the Isle of Lewis where the North-east Lewis MPA is designated to protect the species. The protected area is approximately 21 km east of the N4 array area. Risso's dolphin may also be present further north near Shetland and there have been some recordings of the species off the northeast coast above Aberdeen.

The Risso's dolphin has a previously known presence within the vicinity of the Project being recorded by Royal Haskoning (2012) in groups ranging from 1 individual to around 10.

4.2.5 Short-beaked common dolphin

The short-beaked common dolphin (*Delphinus delphis*) is distributed throughout temperate and tropical waters of the Pacific Ocean and into the North Atlantic Ocean as well as the Mediterranean and Black Seas. It is a pelagic species usually found in deeper waters and around continental shelves. In Scotland, it is most abundant in offshore waters off the west coast. Over summer months (May to October), the short-beaked common dolphin can be present in the Sea of the Hebrides and sporadically in the North Sea due to a peak in food abundance. However, since 2004, sightings have been recorded in every month of the year off the west of Scotland.

The common dolphin is known to have a presence within the vicinity of the Project as it was previously recorded by Royal Haskoning (2012). Throughout the survey there were multiple sightings of groups of >10 individuals present.

4.2.6 Other species

The following species have not been recorded in the ongoing Project specific digital aerial surveys however are known to have a presence here based on previous data.

4.2.6.1 White-beaked dolphin

The white-beaked dolphin (*Lagenorhynchus albirostris*) is an offshore species but is also common inshore as it tends to prefer waters no deeper than 200 m. Usually found in large pods, it can be in mixed schools with the Atlantic white-sided dolphin. They occur all around Scotland's coasts and are widespread throughout the North Sea. Their highest abundances are recorded northwest of Scotland around the Isle of Lewis.

4.2.6.2 Long-finned pilot whale

The long-finned pilot whale (*Globicephala melas)* is mostly distributed in the Atlantic Ocean but has a presence around the world, it is an offshore species but can also be found inshore. Around Scotland they are typically found on the west and north coasts as well as in smaller numbers inshore in the northeast. They are a social species and can be found in large groups of over 1000 individuals, however the group sizes of the long-finned pilot whales within the Sea of the Hebrides are typically smaller reaching up to 20 individuals.

4.2.6.3 Beaked whale spp.

Hammond *et al.* (2021) data groups all beaked whale spp. data together, using information from Hague, Sinclair, & Sparling, (2020), it is likely this includes the 3 species northern bottlenose whale (*Hyperoodon ampullatus*), Sowerby's beaked whale (*Mesoplodon bidens*) and Cuvier's beaked whale (*Ziphius cavirostris*).

Northern bottlenose whale

The northern bottlenose whale has been recorded around several shores of Scotland but is much more prevalent in the northwest. Although it is an offshore species commonly found in the North Atlantic Ocean, they can occur around the northern and western isles of Scotland. They have been recorded off the north, east and northwest coasts of the Isle of Lewis.

Sowerby's beaked whale

The Sowerby's beaked whale is an oceanic and coastal species found distributed in the North Atlantic Ocean as well as being present around the coasts of the northern and western isles of Scotland and along in some inlets along the east coast of Scotland such as the Firth of Forth, near Montrose and the Moray Firth. This species has been recorded on the east and west coasts of the Isle of Lewis.

Cuvier's beaked whale

The Cuvier's beaked whale is a deep-sea species usually found in small groups or alone. It can occasionally be confused for the northern bottlenose whale. This species can be present along the west coast of Scotland up into the northern isles of Orkney and Shetland. It can be found on many coasts of the Outer Hebrides and has been recorded off the north, east and west coasts of the Isle of Lewis.

4.2.6.4 Striped dolphin

The striped dolphin (*Stenella coeruleoalba*) is widely distributed in tropical and temperate waters however can rarely be sighted in the UK during summer months between July and September. They have been recorded along the west coast of Scotland around the coasts of the western and northern isles. They have been known to be present off the east and northwest coasts of the Isle of Lewis.

4.3 Basking Shark Presence

The basking shark is the second largest fish and is fully protected in Scotland. In December 2020, the Sea of the Hebrides nature conservation MPA was designated for basking sharks and minke whales. The species is a Priority Marine Feature and has been recorded all around Scotland. They are more commonly recorded on the west coast and mainly during summer months as they are a migratory species which return to Scottish waters between May and October following prey availability where oceanic mixing causes zooplankton to occur in high concentrations. Although most sightings of basking sharks in Scotland are concentrated in the southern Sea of the Hebrides, the species has also been recorded off the coasts of the Isle of Lewis and as far north as Orkney and the Shetland Islands (Marine Scotland, 2020b). Basking shark presence was previously recorded within the area of

cable corridor by Royal Haskoning (2012). No sightings of basking shark have been recorded to date in the site specific digital aerial surveys.

5. EPS AND BASKING SHARK RISK ASSESSMENT

As discussed in section 4, a range of cetacean species and basking sharks are known to be present within or near by the Survey Area, potentially resulting in them being affected by the Surveys.

The main potential impacts resulting from the Surveys are:

- collision with vessels,
- increased noise from geophysical survey systems/use of USBL in the geotechnical, geophysical and environmental survey; and
- increased noise from vessels.

Collisions with vessels have the potential to cause physical injury and/or death to affected individual animals. The impacts from increased noise are more likely to cause a behavioural response in the animals resulting in a physical disturbance. Should this to occur, it is likely to only be a temporary displacement during the Survey activities and will not be permanent.

The increase in noise also has potential to cause auditory injury in animals such as Permanent Threshold Shift (PTS) or Temporary Threshold Shift (TTS) due to the increase in underwater noise. TTS is short term and animals recover relatively fast (minutes to hours) however PTS permanently injures the animal by causing hearing loss which has detrimental effects reducing their survival (Tougaard, 2021). The levels at which PTS and TTS onset occurs in different cetacean hearing groups is summarised in Table 5.

Southall *et al*., (2007) set out criteria for the levels at which species are exposed to PTS and TTS, these have since been updated and are shown in Southall *et al*., (2019). The level of noise impacts differs between impulsive and non-impulsive noise.

Table 5: PTS and TTS onset thresholds for cetacean hearing groups

Functional Hearing Group	PTS onset, SPLR, 0-pk, flat (dB re 1µPa)	PTS onset SELcum, 24hr (dB re 1µPa2-s)	TTS onset, SPLR, 0-pk, flat (dB re 1µPa)	TTS onset SELcum, 24hr (dB re 1µPa2-s)
Very High Frequency Cetaceans	202	155	196	140
Medium/High Frequency Cetaceans	230	185	224	170
Low Frequency Cetaceans	219	183	213	168

Source: Southall et al., (2019); NOAA, (2018).

Note: peak sound pressure level measured at distance R (SPLR) and the cumulative sound exposure level (SELcum), for a recommended accumulation period of 24 hours.

It is known that some animals show natural avoidance behaviour in situations when they are disturbed including situations where noise has been introduced into their environment. This response has been observed in baleen whales, odontocetes and pinnipeds (MMMT, 2022; Gordon *et al.,* 2003).

5.1 Likelihood of Impact

5.1.1 Cetacean Impacts

5.1.1.1 Impact from Geophysical, Geotechnical and Environmental Survey Equipment Noise

The use of geophysical, geotechnical and environmental survey equipment will increase the level of anthropogenic noise in the marine environment as they emit and receive sounds. As mentioned in section 5.1 cetaceans are vulnerable to underwater noise as they use sound as their primary source to survive. Species have different hearing frequencies ranges meaning that not all the species are equally sensitive to the levels of noise, these are summarised in Table 6 and Table 7.

PCPT, borehole sampling, the use of vibrocores, DDV, BRUV, grab sampling and water sampling associated with the geotechnical and environmental surveys are considered unlikely to create significant levels of noise. Noise emitted from these activities will be limited and are unlikely to exceed noise levels emitted by the survey vessels. For this reason, these activities are not considered further in this report. Potential impacts from collision, vessel noise, and noise emitting survey equipment is discussed below.

Table 6: Functional hearing groups of the cetacean species recorded during the digital aerial surveys to date

Functional Hearing Group	Species
Very High Frequency (200 Hz – 180 kHz)	Harbour porpoise
Medium/High Frequency (150 Hz – 160 kHz)	Bottlenose dolphin
	Risso's dolphin
	Common dolphin
Low Frequency (7 Hz – 22 kHz)	Minke whale

Source: Southall *et al.,* (2019).

Table 7: Functional hearing groups of other cetacean species likely to be present

Functional Hearing Group	Species
Medium/High Frequency (150 Hz – 160 kHz)	White-beaked dolphin
	Pilot whale
	Beaked whale spp.
	Striped dolphin

Source: Southall *et al.,* (2019).

Multi-beam Echo Sounder (MBES)

Very high frequency cetaceans, such as harbour porpoise, are sensitive to certain frequencies within the operational capability of MBES systems. There is the potential for auditory injury to occur. However, considering natural avoidance behaviour, the peak source level of the sound source and the sound pressure level (SPL) and sound exposure level (SEL) for injury that injury is unlikely to occur. It should be noted that the proposed peak source level of 220 dB re 1µPa @1 m is a maximum and will drop exponentially due to spherical spreading and greater attenuation of high frequencies, and that as the Survey Area is relatively shallow (<200 m as defined in the JNCC guideline), the high

frequency sounds produced by this equipment are likely to attenuate more quickly than lower frequencies used in deeper waters (JNCC, 2017).

Sub-bottom Profiler (SBP)

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

The lower frequencies generated by SBPs have the potential to cause localised short-term impacts on behaviour for all cetaceans present in the Survey Area, possibly resulting in avoidance at close proximities (Nedwell *et al.,* 2008).

Side Scan Sonar (SSS)

SSS equipment operates at extremely high frequencies ranging from 300 – 900 kHz. This is well above the range of all the species likely to be present in the Survey Area as the highest frequency that can be heard is up to 200 kHz by harbour porpoise, therefore is not expected to cause auditory injury or disturbance.

Ultra-short Baseline (USBL)

The USBL equipment for the geophysical, geotechnical and environmental survey runs at frequencies ranging from 18 – 50 kHz, these can be heard by all species present. The onset of PTS from this equipment may be induced at greater distances from source if animals remain stationary and associated with the vessel. In modelling completed for Vattenfall (Binnerts *et al*., 2020), it was shown that stationary harbour porpoise within 2.8 km of USBL equipment operating at 18 kHz in 35 m water depth may suffer PTS onset, while stationary animals would need to be within 1.7 km of the USBL equipment operating at 32 kHz (this is considered overly precautionary as animals are unlikely to be stationary). Passing harbour porpoise within 970 m of equipment operating at 18 kHz and 570 m of equipment operating at 32 kHz in 35 m water depth were shown to be at risk of PTS onset. In shallower waters these distances decrease: harbour porpoise passing equipment operating in 5 m of water were shown to be at risk of the onset of PTS at 2.3 km (18 kHz) and 1.1 km (32 kHz). The risk of the onset of PTS for all other species was shown to be negligible unless the animal was assumed stationary throughout the entire period of operation the USBL system (Binnerts *et al*., 2020).

The lower frequencies generated by USBLs have the potential to cause localised short-term impacts on behaviour for all cetaceans present in the Survey Area, possibly resulting in avoidance at close proximities (Nedwell *et al*., 2008). It should be noted that the surveys will occur over a range of water depths, including equipment operating at depths greater than 35 m as well as inshore meaning that the levels of impact described above for Vattenfall will not be applicable for the full 155 days of survey (if running one after another, although unlikely).

Based on the above information, an EPS licence may be required for this potential impact (injury/death and disturbance due to underwater noise generated by survey equipment) and this is discussed further within this risk assessment.

5.1.1.2 Impact from Vessel Noise

The use of a vessels for the Surveys will increase the level of anthropogenic noise in the marine environment which will in turn will increase the potential of impacts occurring on cetaceans present.

An increase in vessel noise can potentially cause behavioural responses in cetaceans through disturbance and can also potentially cause auditory injury to the animals such as PTS or TTS.

Where a large vessel is used, there is a possibility that any cetaceans less than one meter from the vessel may suffer auditory injury (MarineSpace, 2019), this is based on a vessel that emits a sound intensity level of 180-190 dB re 1µPa @ 1m rms. It is considered highly unlikely that any animals will be within such close proximity, and mitigation measures will be in place to reduce this possibility (see section 5.5).

Due to the noise frequencies that large and medium vessels produce (few hundred Hz), very high frequency cetaceans are most at risk of being disturbed. For the Surveys, harbour porpoise has the greatest potential of showing a behavioural response to vessel noise. The impacted range for harbour porpoise from a large sized vessel is less than 50 m (Barham & Mason, 2018), with the mitigation measures proposed in Section 5.5 the likelihood of an animal being in close proximity whilst the vessel is operating will be unlikely.

Overall, it is unlikely that vessel noise will cause any auditory injury to any cetacean species and it is also unlikely that vessel noise will result in a behavioural response that is different from that caused by the usual level of vessel activity in the area. Following Marine Scotland guidance (Marine Scotland, 2020a) for inshore waters, it is considered that there is no potential for an offence to be committed as defined in Regulations 39 (1) (a), (b) and 39 (2) of the Habitats Regulations. Based on the above information, an EPS licence is deemed not required for this potential impact (disturbance due to vessel noise).

5.1.1.3 Impact from Collision

The movement of vessels in areas that support populations of cetaceans has the potential to result in collisions between vessels and cetaceans. Collisions can cause fractures, bruising, cuts, and ultimately the death of affected individuals. Whilst vessels of all sizes can cause collisions, more serious incidents are usually caused by vessels travelling at higher speeds (Wang *et al.,* 2007). If a large vessel reduces its speed to 10 knots it can reduce the probability of lethal injury to whales to less than 50% (Vanderlaan & Taggart, 2007).

The vessels will travel along predefined routes from port to the survey locations, and when carrying out the Surveys, the vessels will follow a linear survey route minimising unnecessary vessel movement. The inshore vessels used in the geophysical survey will only travel between the speed of 3 and 4 knot during surveying and at a maximum of 8 knot in between surveying. The offshore vessels used in the Surveys will only travel between the speed of 3.5 and 5 knot during surveying and at a maximum of 10 - 14 knot in between surveying. As the routes of the vessel will be confined and the speed will be slow, this greatly reduces the risk of collision.

Following Marine Scotland guidance for inshore waters (Marine Scotland, 2020a), the potential for injury or disturbance to EPS, as defined in Regulations 39 (1) (a) and (b) and 39 (2) of the Habitats Regulations, from collision with vessels associated with the proposed work is negligible. As no offence as described in Regulation 39 of the Habitats Regulations will be committed, an EPS licence will not be required for this potential impact (injury/death due to collision with vessels).

5.1.2 Basking shark impacts

Like all sharks, basking sharks only have an inner ear. Their ears are located on either side of their head and are formed by 3 cartilage tubes lined with hairs and filled with fluid. The hairs vibrate as sound waves pass through them and the brain can then interpret sounds (Shark Trust, 2022). Sharks have a restricted hearing sensitivity, hearing only low frequency sounds between 20 Hz and 1500 Hz with a peak between 200 and 600 Hz (Chapuis *et al*., 2019).

There is no direct evidence that sound causes basking shark mortality or stress (Wilding, Wilson, & Tyler-Walters, 2020) and furthermore the hearing range of the animal is well below the frequency of any of the geophysical survey equipment that may be used. As the basking shark does not vocalise

and do not rely on hearing when foraging (Booth, King, & Lacey, 2013), it is assessed that the increase in anthropogenic noise from the Surveys will not have a likely impact on the species either by disturbance or injury.

Although, there are some reports of basking sharks moving away from boats it is still thought that they are mostly unaware of surface vessels when nearby. This could potentially lead to collisions occurring in the absence of mitigation. NatureScot (2020), advises that best practice such as the "JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys (seismic survey guidelines)" (JNCC, 2017) is followed to ensure that disruption to basking sharks is kept to a minimum, specifically during the months of April and October. Accordantly, throughout the Surveys basking sharks will be treated with the same mitigation measures as cetaceans and will be included in the search by MMOs (see section 5.5). There will also be an ongoing watch for the species during daylight operations. Based on the above information, impacts to basking sharks are considered unlikely and a basking shark licence is deemed not necessary.

5.2 Magnitude of Impact

As there has been no detailed modelling carried out, this assessment is based on literature and assumes the worst-case throughout. The species that have been assessed are those known to have been distributed around the Isle of Lewis from the most recent published literature further informed by the initial digital aerial surveys which commenced in March 2022. Worst case assumptions have been used when considering the type of geophysical and geotechnical equipment being used (from an underwater noise generation perspective) and the area disturbed by the Surveys (based on JNCC 2020 guidance).

Density estimates from the updated June 2021 version of SCANS III (Hammond *et al*. 2021) which is based on Hammond *et al*. (2017), have been used to determine the worst-case number of individuals of each species present within the Survey Area that may be impacted. To calculate the percentage of the reference population that may be impacted, abundances from the Inter-Agency Marine Mammal Working Group (IAMMWG) "Updated abundance estimates for cetacean Management Units in UK waters guidance" (IAMMWG, 2022) have been used for all species apart from beaked whale, pilot whale and striped dolphin which there was no available data, for these species the total abundance estimates for the relevant population from Hammond *et a*l. (2021) were used. Comparable abundances have also been included from Royal Haskonings (2012) which carried out previous surveys in a portion of the Survey Area in 2010/11. Only species which were recorded in blocks J in the aerial surveys of Hammond *et al*. (2021) (that include the Project) and the bottlenose dolphin due to its previously known presence have been included in the assessment. The results are shown in Table 8.

Table 8: Summary of Potential Impact

Species	Species Density	Management Unit	Abundance in Management Unit	Comparable Abundance[1]	No. of Individuals potentially disturbed in the Area of Potential Disturbance 817 km^2)	Percentage of the reference population potentially disturbed
Beaked whale	0.0092	N/A	1,489	Not calculated	8	0.54%
Bottlenose dolphin	0.0075	Coastal West Scotland & Hebrides	45	Not calculated	6	13.33%

Species	Species Density	Management Unit	Abundance in Management Unit	Comparable Abundance[1]	No. of Individuals potentially disturbed in the Area of Potential Disturbance 817 km^2)	Percentage of the reference population potentially disturbed
Harbour porpoise	0.308	West Scotland	28,936	385,617	252	0.87%
Pilot whale	0.0537	N/A	5,215	Not calculated	44	0.84%
Minke whale	0.0184	Celtic and Greater North Seas	20,118	18,614	15	0.07%
Risso's dolphin	0.1923	Celtic and Greater North Seas	12,262	Not calculated	157	1.28%
Common dolphin	0.1333	Celtic and Greater North Seas	102,656	63,366	109	0.11%
Striped dolphin	0.0044	Celtic and Greater North Seas	19,253	Not calculated	4	0.02%
White-beaked dolphin	0.217	Celtic and Greater North Seas	43,951	22,664	177	0.40%

[1] *Comparable abundances from Royal Haskoning, (2012).*
Note: Royal Haskoning (2012) collected marine mammal and basking shark data from the northwest coast of the Isle of Lewis between September 2010 and September 2011, part of this 2 km study area covered some of the proposed Survey Area therefore the abundances have been included for comparison.

As shown in Table 8, there is potential for disturbance of species that could be present, however for the majority of species the impact will affect a very small percentage of the reference populations. Bottlenose dolphin and Risso's dolphin have the potential to be most affected, with over 1% of their reference populations potentially impacted. The highest number of individuals to be impacted is harbour porpoise with 252 individuals, which only equates to 0.87% of the reference population.

Although a relatively high percentage of the reference population of bottlenose dolphin may potentially be impacted (13.33%) which is considered moderate, the actual likelihood of the species being within the vicinity of the Project is expected to be low. The abundance data used to calculate this percentage is for the coastal west Scotland and Hebrides management unit, which covers all of the coastal waters on the west coast of Scotland. Within Scottish waters a smaller bottlenose dolphin population resides on the west coast, with the whole of the population of around 55 individuals residing south of the Sea of the Hebrides and ranging between Skye and Kintyre and around the Isle of Barra. Records of bottlenose dolphins are less frequent on the north coast of Scotland (NatureScot, 2021).

As mentioned, the geophysical survey will occur over a period of 75 days in total, (excluding weather standby) with vessels working concurrently at some points; the geotechnical and environmental surveys will occur for 1 to 2 months (excluding weather standby) and 20 days respectively, but use less noise emitting equipment. Within this timeframe, use of equipment will be intermittent with periods of inactivity during weather downtime, vessel resupplies and whilst the vessel turns between transit lines for the geophysical survey. Furthermore, impact magnitude is likely to be less than assessed in this worst-case scenario. For example, broadband received levels from all chirp SBPs tested, in addition to MBES, SSS and boomer SBP devices, have been shown to rapidly attenuate with distance from sound source, including particularly pronounced fall-off for directional sources when the receiver was outside of the source's main beam (Halvorsen and Heaney, 2018). If

disturbance does occur, suitable habitat exists nearby to the Survey Area for cetaceans to inhabit. Cetaceans would be expected to return to the Survey Area quickly if disturbance had occurred, for comparison, after cessation of pile driving, which generates significantly larger amounts of impulsive noise compared to geophysical and geotechnical surveys, harbour porpoise return to the area within between a few hours (Tougaard *et al.* 2009; Brandt *et al.* 2012; Dahne *et al*. 2013) and up to 3 days (Diederichs *et al.* 2009; Brandt *et al.* 2011). To summarise, if disturbance does occur it will brief, over a small area, with recovery likely within a short timeframe.

The Surveys will be carried out during Spring and Summer months beginning in April 2023 and planned to finish by October 2023. However, to allow extra time assuming it is possible the Surveys may be delayed due to unforeseen circumstances such as bad weather, the Surveys may finish later in October 2024. This time period aligns with the migration periods of vulnerable species meaning it will be more likely they are present. Although this adds an increase for the potential of disturbance, it is less feasible to carry out the Surveys over winter months when there is a smaller likelihood that vulnerable species will be present due to migration periods due to the bad weather. It should be noted that although the Surveys may last up to 13 months, the actual total amount of geophysical surveying days is only 75 days inclusive of testing days, and geotechnical and environmental surveying a maximum of 3 months. Furthermore, mitigation measures as described in Table 9 will be in place to reduce any disturbance throughout surveying. Any impacts caused are likely to be temporary due to the short time that the Surveys will actually be taking place. There is not expected to be long term impacts.

5.3 Cumulative Impacts

Other activities taking place within the vicinity of the Surveys may result in cumulative impacts. No other projects taking place in a similar area to the Surveys have been identified via the Marine Scotland Licence Application Register. However, cumulative underwater noise impacts may occur from surveys or works associated with the development of ScotWind's N3 site (now named Talisk Offshore Wind Project) shown in Figure 3 which was awarded to Magnora Offshore Wind, as the development of this site is also likely to require site specific geophysical surveys. The N3 site is located over 25 km from the N4 array area. Based on guidance, underwater noise disturbance impacts are not expected to occur over 5 km from the Survey Area, therefore the offshore wind sites are not likely to cause a cumulative underwater noise impact. Export routes from Magnora Offshore Wind's N3 site is currently not available in the public domain. Development timelines for the N3 windfarm are currently unknown, but cumulative impacts can be prevented by adequate scheduling of noise generating activities if required, such as geophysical surveys. Figure 3 also shows the location of N2 ScotWind site (labelled as number 14) which is also being developed by Northland Power. Given the distance between the N4 array area and the N2 site (>30 km) cumulative underwater noise impacts are not likely. Cumulative impacts are therefore considered to be very unlikely for the Surveys.

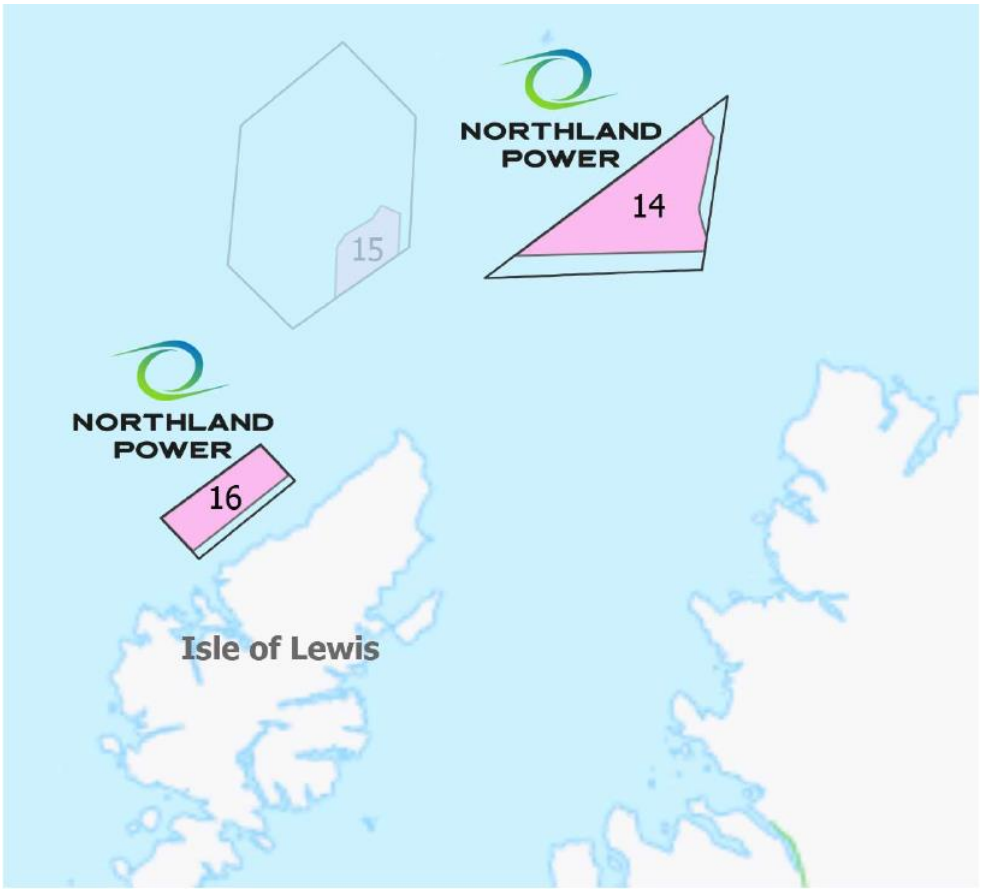

Figure 3: Location of ScotWind's N3 Site (15) in relation to Northland Power N4 (16) site and Northland Power N2 (14) site.

5.4 Alternatives

Alternative methods and locations of the Surveys are considered in section 6.2.

5.5 Proposed Mitigation

Impacts from the geophysical, geotechnical and environmental surveys can be limited by reducing the amount of noise that is emitted into the marine environment. To do this, the lowest practicable power levels will be used throughout the Surveys, and the SBP and other geophysical survey equipment will only be fired when necessary.

JNCC has published guidance for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017). Throughout the Surveys this guidance will be followed ensuring that any disturbance effects on marine EPS or basking sharks in the area will be kept to a minimum and should not impact on the FCS of the species likely to be found within the Survey Area. The equipment used in the Surveys are electromagnetic sources and therefore are not required to follow as strict mitigation measures as airguns, however some of the measures are the same. The mitigation measures that will be followed are summarised below in Table 9.

Table 9: Mitigation Measures

Measure	Details
Pre-shooting search	A search must be carried out before any soft start or works can begin. This will be carried out by MMO or Passive Acoustic Monitoring (PAM) operatives and there must be clear communication between searchers and crew.

Measure	Details
Marine Mammal Observer (MMO)	A trained, non-dedicated MMO should be present on the vessel. During mitigation periods the MMO must survey the sea surface for the presence of cetaceans and basking sharks within the mitigation zone of the survey site ensuring no individuals are present prior to the commencement of any survey operations.
Passive Acoustic Monitoring (PAM)	PAM on the vessel is proposed as an additional mitigation measure for survey works undertaken in the hours of darkness or poor visibility.
Mitigation Zone	The MMO or PAM operative will monitor the agreed mitigation zone which is a standard of 500 m from the centre of the airgun array or noise source location.
Duration of Search	The mitigation zone must be monitored throughout the entire pre-shooting search and soft-start procedures. The pre-shoot search must be carried out for: ■ 30 minutes prior in water less than 200 m deep. ■ 60 minutes prior in water greater than 200 m deep.
Delay	If cetaceans are detected in the mitigation zone during the pre-shoot search, the commencement of the survey or soft start where applicable, must be delayed until the animal has passed out of the mitigation zone. There must be a 20-minute delay from the last detection of the animal out with the mitigation zone before the surveying or soft-start can begin. 1. 2. If cetaceans are detected within the mitigation zone once the airguns are firing, either during the soft-start or full power, there is no requirement to stop.
Soft Start	Some of the geophysical survey equipment that may be used in the survey operations are not capable of undertaking “soft start” procedures, however, where the devices can use this procedure, it will be used.
Line Change Rules	If line changes are expected to take more than 40 minutes, firing should be terminated in between lines and a pre-shooting search, delay and soft start should be followed before the new line begins.

Source: JNCC (2017).

5.6 Summary of Impacts

The most likely effects relate to the harbour porpoise who utilise the very high frequency range, as harbour porpoise can be both disturbed and injured by the use of survey equipment. Disturbance effects are expected to be temporary, with disturbed species expected to return the Survey Area shortly after survey activities are completed. Injury risk will be minimised following mitigation through the presence of MMO’s and other mitigation measures detailed above in Table 9. Although a relatively high percentage of the reference population of bottlenose dolphin may potentially be disturbed (12.17%, equating to 5 individuals), the actual likelihood of the species being within the vicinity of the Surveys is expected to be low with only one bottlenose dolphin being recorded in seven months of digital aerial surveys to date, the likelihood and magnitude of disturbance will be further reduced through mitigation measures being in place. The risk of collision is considered to be very low for all marine EPS species.

Furthermore, as it has been shown that noise generated by the Surveys will not impact basking sharks and there will be a presence of MMO’s minimising collision risk, the impacts on basking sharks is considered negligible. Therefore, **a basking shark licence is deemed not necessary.**

The assessment above shows that the risk of a disturbance offence of cetaceans being committed is low but cannot be completely dismissed. Therefore, **an EPS disturbance licence for the geophysical, geotechnical and environmental survey operations will be required**.

6. EPS LICENCE ASSESSMENT

Following the Marine Scotland (2020a) guidance it is proposed that, with mitigation for the Surveys in place, potential impacts from the proposed survey campaigns are unlikely to result in the harassment, injury or death of an EPS as defined under Regulation 39(1) of the Habitats Regulations. Disturbance of an EPS due to the Surveys is also unlikely but cannot be ruled out as a possibility.

In relation to Regulation 39(2) of the Habitats Regulations, the percentage of the reference population of majority of species which has the potential to be disturbed by use of the survey equipment is considered to be negligible and therefore not detrimental to the maintenance of the population of the species concerned at a FCS. This is an exception for the bottlenose dolphin where the percentage of the reference population of species which has the potential to be disturbed by use of the geophysical survey equipment is considered to be moderate. However as previously explained it is rare that bottlenose dolphins will be present in this Survey Area and with mitigation measures in place it is unlikely that species will be impacted and therefore the Surveys will not be detrimental to the maintenance of the population of the species concerned at a FCS.

Disturbance is likely to be localised and short-term, with impact magnitude likely to be less than predicted in this worst-case assessment, and with mitigation (Table 9) is considered unlikely to have an impact on the FCS of any cetacean EPS. Disturbance will not be sufficient to cause any population level effects, and thus it is considered that an EPS licence (to disturb) can be issued under Regulation 39 of the Habitats Regulations.

6.1 Test 1 'Purpose'

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

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

- a) Scientific or educational purposes.
- b) Ringing or marking, or examining any ring or mark on, wild animals.
- c) Conserving wild animals or wild plants or introducing them to particular areas.
- d) Protecting any zoological or botanical collection.
- e) Preserving public health or public safety or other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment.
- f) Preventing the spread of disease.
- g) Preventing serious damage to livestock, foodstuffs for livestock, crops, vegetables, fruit, growing timber, or any other form of property or to fisheries.

The proposed Surveys associated with the development of the Project meets the requirements of Regulation 44 (2) (a) by providing information about the local marine environment for use in the upcoming assessment and (e) by providing environmental benefit on a national and international scale and helps to deliver national and international environmental policies in relation to climate change, the achievement of renewable energy targets and reduction of greenhouse gasses. The Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 sets a target of net-zero emissions of all greenhouse gasses by 2045. The development of renewable energy is a key factor in reaching this target to improve Scotland's environmental status. The proposed windfarms meet these requirements by providing beneficial consequences of primary importance for the environment and the Surveys are an integral part of developing the windfarms and reaching the net-zero target on time.

6.2 Test 2 'Alternatives'

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

6.2.1 Alternative Method

The most significant risk to EPS from the survey campaigns is the potential impacts of anthropogenic noise produced by the survey equipment. The equipment likely to cause the biggest impact is the SBP and USBL which operate within the hearing frequency of cetaceans known to be in the area. The use of the SBP is vital to obtain an accurate picture of the seabed, sediment, and any likely obstructions. SBP gives greater confidence that there will be no anomalies encountered on the seabed during turbine foundation and cable installation, which could have severe economic and/or environmental consequences at later stages of the project. Similarly, the USBL is needed to accurately position and control the survey equipment underwater. Not tracking the equipment would have potentially severe consequences including loss of equipment, having both economic and environmental impacts, and potential health and safety effects on other sea users. The use of lower impact survey equipment or not using certain noise generating equipment is deemed not viable as an alternative.

The alternative of using previously gathered data such as the data collected by Royal Haskoning (2012) rather than undertaking new surveys was considered. However, after reviewing the data it was determined not sufficient for the windfarm development purposes as available data covered a very small portion of the Project area. Royal Haskoning data has been used to inform this EPS risk assessment.

6.2.2 Alternative Location

The N4 Plan Option was one of 15 Plan Options, split across 4 regions, identified for offshore wind development within the Sectoral Marine Plan for Offshore Wind Energy (Scottish Government, 2020). The Plan Options were developed based on opportunity and constraints analysis, environmental and socio-economic assessment and consultation with stakeholders. As the location of N4 had been previously agreed and leased by CES, the Project location cannot be altered and therefore the Surveys must be carried out at this proposed location. It is worth noting that within the N4 zone the area closest to shore was excluded from the option, creating a wider corridor during operation between the wind farm and the shore to reduce visual impact and accommodate sea users and migratory salmon during construction. Although the whole area is still required to be surveyed for the cable route.

6.3 Test 3 'Conservation Objectives'

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

Marine Scotland outlines the definition of a 'favourable' conservation status in "The protection of Marine European Protected Species from injury and disturbance Guidance for Scottish Inshore Waters (July 2020 Version)" (Marine Scotland, 2020a). The conservation status will be taken as 'favourable' when:

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

Over 1% of Risso's dolphin reference population may potentially be impacted (1.14%) however this is still relatively low and with mitigation it is also considered to be negligible. A higher percentage of reference population of bottlenose dolphins may be impacted (12.17%), however as explained in Section 5.2 it is unlikely that the species will actually be present and the likelihood and magnitude of impact will be further reduced through mitigation measures being in place.

Furthermore, as described in Section 5.2, if disturbance does occur it will brief, over a small area, with recovery likely within a small timeframe (within 3 days). Given the large amount of suitable habitat available surrounding the Survey Area, it is not likely that such a behavioural response (disturbance) would impair the ability of the animal to survive or reproduce or generate significant population-level impacts. Mitigation measures will be in place to ensure cetaceans are not within close proximity to the Surveys allowing them to move to suitable habitats within the same management units to avoid the disturbance for the short time period.

Following the above definitions of FCS, the Surveys are concluded not to have a detrimental effect to the maintenance of the population of any of the species concerned at FCS.

6.4 Summary

As demonstrated, the proposed Surveys satisfy all 3 EPS tests as the activity has a licensable purpose, there are no satisfactory alternatives, and it will not be detrimental to any species FCS. As risk of disturbance impacts cannot be discounted due to noise produced from some of the Survey equipment, **an EPS licence (to disturb) will be required for the Project** to carry out the proposed Surveys.

Noise emitted by the Surveys will not impact basking sharks and there will be a presence of MMO's minimising collision risk. Impacts to basking sharks are deemed extremely unlikely and **a basking shark licence is deemed not necessary**.

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