APPENDIX C

European Protected Sites and Species Risk Assessment

XODUS ASSURE

EPS and Protected Sites and Species Risk Assessment

EPS and Protected Sites and Species Risk Assessment – West Highlands

Scottish and Southern Energy plc

Assignment Number: A302244-S02
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CONTENTS

ACRONYMS

AA	Appropriate Assessment
ADCP	Acoustic Doppler Current Profiler
AUV	Autonomous Underwater Vessel
cSAC	candidate Special Area of Conservation
DECC	Department of Energy and Climate Change
DSV	Diving Support Vessel
EPS	European Protected Species
FCA	Favourable Conservation Status
HF	High Frequency
HRA	Habitats Regulations Appraisal
HWDT	Hebridean Whale and Dolphin Trust
Hz	Hertz
IROPI	Imperative Reason of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
kHz	kilohertz
LF	Low Frequency
LSE	Likely Significant Effect
MAG	Magnetometer
MBES	Multi Beam Echosounder
MHWS	Mean High Water Spring
MS-LOT	Marine Scotland Licensing Operations Team
MU	Management Units
NCMPA	Nature Conservation Marine Protected Area
NMFS	National Marine Fisheries Service
NMPi	National Marine Plan Interactive
NOAA	National Oceanic and Atmospheric Administration
PCPT	Piezocone Penetration Testing
PMF	Priority Marine Feature
pMPA	proposed Marine Protected Area
RIB	Rigid Inflatable Boat
ROTV	Remotely Operated Towed Vehicle
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SBP	Sub-Bottom Profiler
SEL	Sound Exposure Level

SHEPD	Scottish Hydro Electric Power Distribution plc
SMWWC	Scottish Marine Wildlife Watching Code
SNH	Scottish Natural Heritage
SPA	Special Protection Area
SPL	Sound Pressure Level
SSS	Side Scan Sonar
SVP	Sound Velocity Profiler
UAV	Unmanned Aerial Vehicle
UK	United Kingdom
USBL	Ultra-short Baseline
UXO	Unexploded Ordnance
WCA	Wildlife and Countryside Act 1981

1 INTRODUCTION

1.1 Introduction

Scottish Hydro Electric Power Distribution plc (SHEPD) holds a licence under the Electricity Act 1989 for the distribution of electricity in the north of Scotland including the Islands.

SHEPD has a statutory duty to provide an economic and efficient system for the distribution of electricity and to ensure that its assets are maintained to enable a safe, secure and reliable supply to domestic and business customers. Electricity is now considered to be an essential service for communities. The cable routes detailed below in Section 1.2 distribute electricity to domestic and business customers; providing a long term economic and social benefit to the communities on the islands. The monitoring of submarine power cables therefore constitutes work of overriding public need.

SHEPD has approximately 104 interconnector cables across the nine Scottish National Marine geographical regions. In order to ensure a safe, secure and reliable supply of electricity to the islands SHEPD is planning to undertake geophysical, geotechnical and environmental surveys of their existing assets:

The proposed survey activities will enable SHEPD to:

- Identify cable location and condition: SHEPD undertake programmed inspections and surveys to understand the condition of the fleet and identify which ones should be taken forward for planned replacement. To date, SHEPD has surveyed around 260 km of the 450 km of cable for which they are responsible. The remaining 190 km will be surveyed by 2023;
- Identify fault locations and carry out repairs; and
- Inform cable routing, protection and decommissioning decisions; as well as ensure accurate installation of new cables and their protection during installation: SHEPD has replaced 40 km of submarine electricity cables since 2017 with a further 93 km to be installed by April 2023.

1.2 Cable Routes

SHEPD is planning to undertake testing and calibration of survey equipment, as well as geophysical and environmental surveys that may be required for the following cable routes in the West Highlands marine region:

- Loch a'Choire North
- Loch a'Choire South
- Loch Eil Narrows
- Skye - Scalpay
- Lochaline - Mull
- Lochalsh (Glenelg)
- Corran Narrows Centre
- Corran Narrows North
- Corran Narrows South
- Kyle - Skye North (1)
- Kyle - Skye South (2)
- Loch Sligachan, Skye East (1)
- Loch Sligachan, Skye West (2)
- Skye Raasay
- Skye – Harris
- Skye – South Uist
- Lochaline (Ardtornish)

For the West Highlands marine region, there are 17 cable routes to be surveyed (95.3 km of cable in total, with a survey corridor width of up to 1,000 m giving a potential total survey area of ~95.3 km^2) as shown on Figure 1.1 and Figure 1.2. The survey activities across the West Highlands geographical area are scheduled to be undertaken sometime between 1st November 2019 and 31st March 2023.

SHEPD has already applied for licences (European Protected Species (EPS) / Basking Shark) to cover survey activities along the Skye-Harris and Skye-South Uist cables as there is an urgent requirement to undertake these surveys as soon as possible, expected to be sometime between 25th October 2019 and 30th June 2020. Since these cables are within the West Highlands region they have been included in this EPS and Protected Sites and Species Risk Assessment as well; the proposed intention is that once the West Highlands Licences are approved these will supersede the Skye-Harris and Skye-South Uist Licences, which will then become void, so as to avoid having duplicate Licences for the same cables. Note that whilst the Skye-Harris and Skye-South Uist cables fall within both the West Highlands and Outer Hebrides marine regions, for ease and clarity of assessment both these cables have been included in this West Highlands Risk Assessment and will not be included in the Outer Hebrides Risk Assessment.

Figure 1.1 Location of cable routes of the West Highlands marine region (northern part)

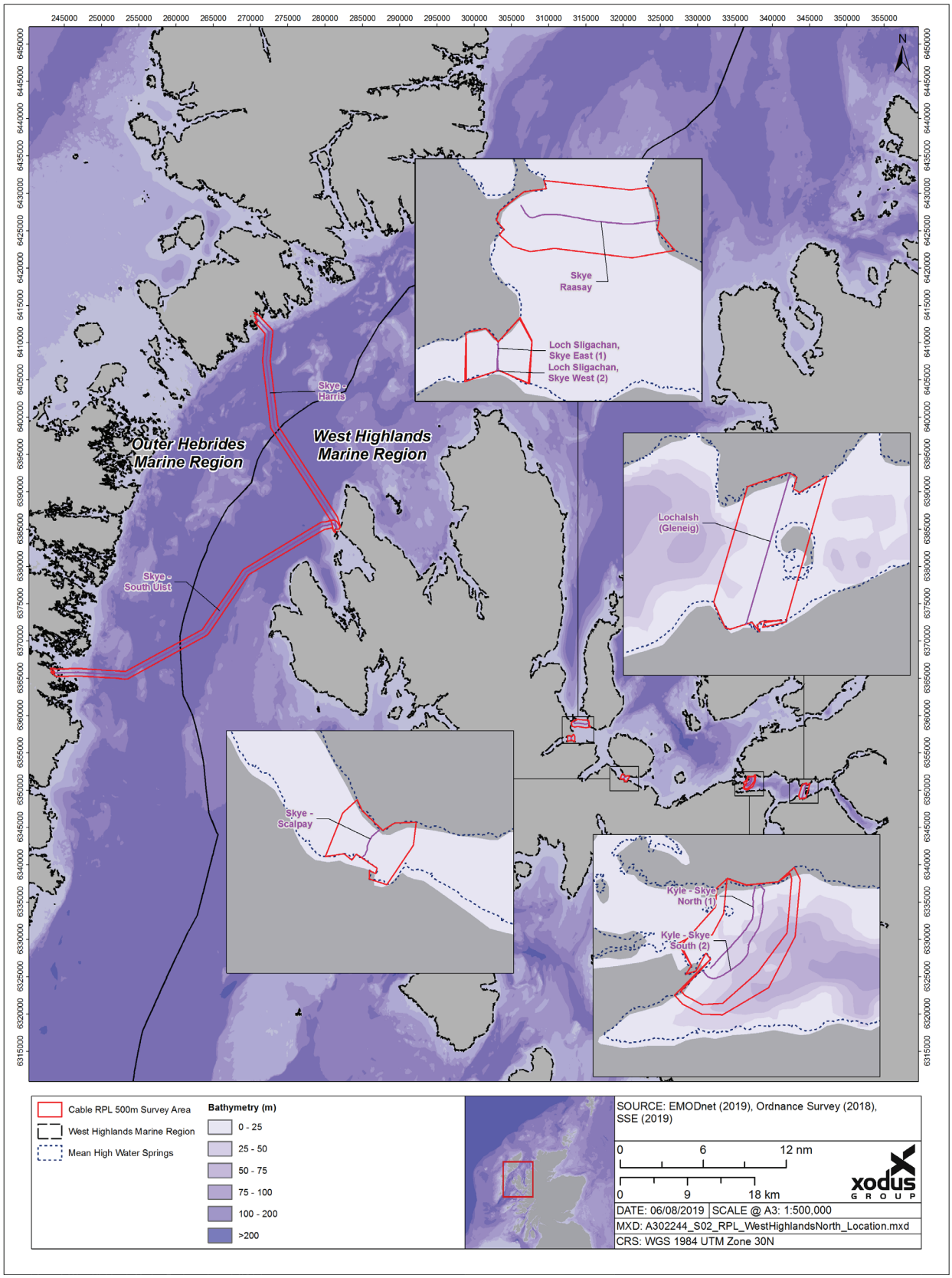
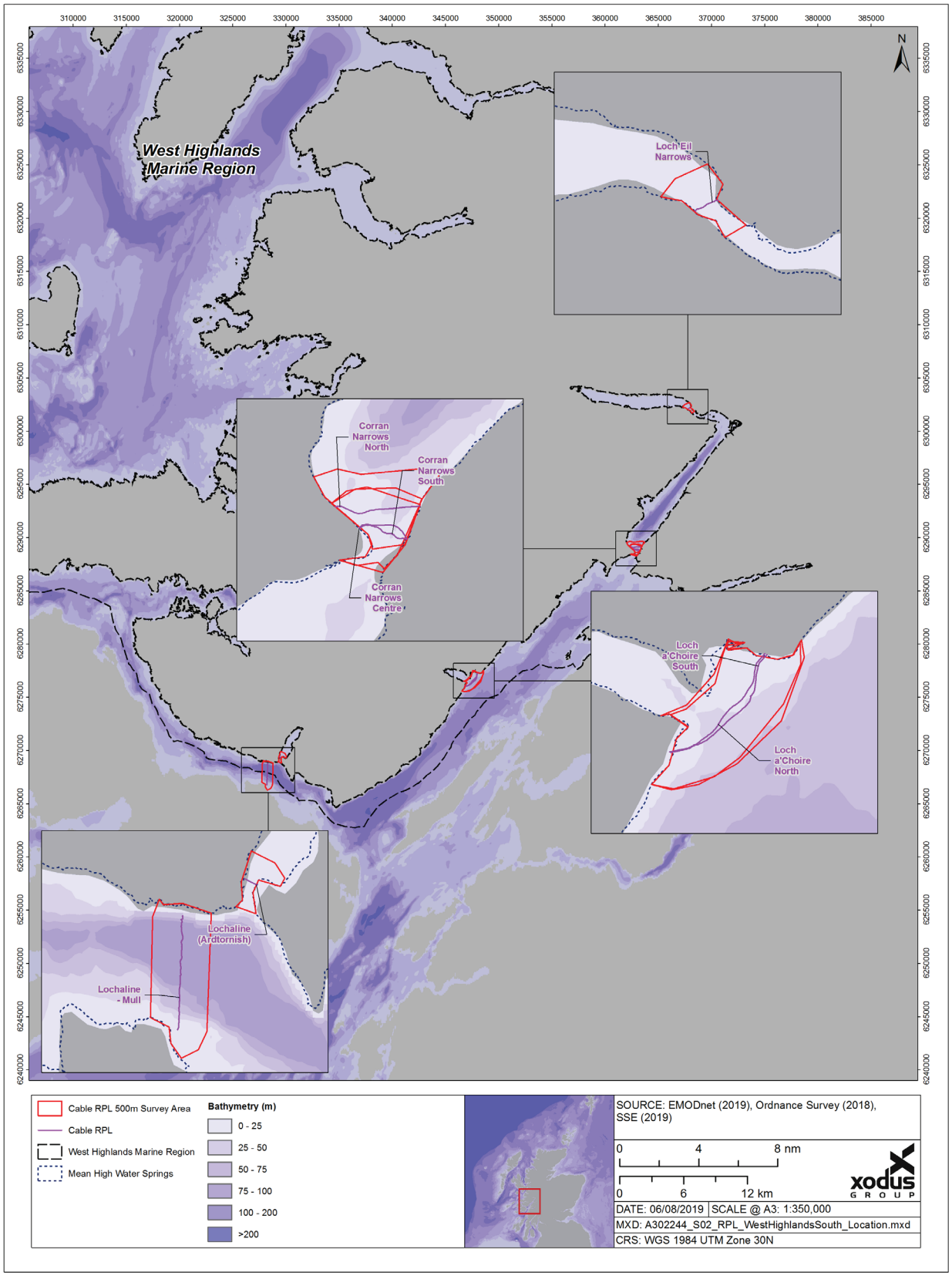


Figure 1.2 Location of cable routes of the West Highlands marine region (southern part)



1.3 Consents and Licences

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

1. An application for an EPS Licence. An EPS Licence is required under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) (the Habitats Regulations) where there is potential for the presence of vessels or underwater noise from the proposed survey activities to injure or cause disturbance to an EPS;
2. An assessment of potential impact on basking sharks as per the Wildlife and Countryside Act 1981 (as amended) (the WCA);
3. The Habitats Regulations Appraisal (HRA) process, which is conducted by the Competent Authority as prescribed by the Habitats Regulations, to asses if the cable inspections or any subsequent surveys have the potential to result in likely significant effects on a Natura site (either alone or in combination with other plans or projects). The Habitats Regulations state that 'the effects of a project on the integrity of a European site need to be assessed and evaluated as part of the HRA process'. This includes any European sites with a marine component as well as any terrestrial or coastal European sites with qualifying features that could potentially be impacted;
4. An assessment of impacts on Nature Conservation Marine Protected Areas (NCMPAs) as per section 82 of the Marine (Scotland) Act 2010;
5. An assessment of potential impacts on designated seal haul-out sites as per Act 117 of the Marine Scotland Act (2010);
6. Notice of intention to carry out a Marine Licence exempted activity for geotechnical sampling of less than 1 m^3 volume per sample; and
7. Notice of intention to carry out a Marine Licence exempted activity for the sediment sampling component of benthic surveys which will be undertaken according to Scottish Natural Heritage (SNH) Guidance Notice No. 45 – Subsea Cable and Oil and Gas Pipeline Proposals – Benthic Habitat and Species Survey Requirements.

For end to end cable route installation, a separate Marine Licence will be submitted and supported by separate environmental supporting documents which will be informed by, and incorporate the findings of, the above listed marine surveys and geotechnical investigations.

1.4 Protected Species

1.4.1 European Protected Species

Cetaceans and Otters

All species of cetacean (whale, dolphin and porpoise) occurring in UK waters and the Eurasian otter are listed in Annex IV of the Habitats Directive as EPS, meaning that they are species of community interest in need of strict protection, as per Article 12 of the Directive. This protection is afforded in Scottish territorial waters (out to 12 nm) under the Habitats Regulations. Regulation 39(1) of the Habitat Regulations make it an offence to:

a) Deliberately or recklessly capture, injure or kill a wild animal of a EPS;

b) Deliberately or recklessly:

   i. Harass a wild animal or group of wild animals of an EPS;

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

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

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

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

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

vii. Disturb such an animal while it is migrating or hibernating.

Further protection is afforded through an additional disturbance offence provided under Regulation 39(2) which states that "it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean)". An EPS Licence is therefore required for any activity that might result in disturbance or injury to cetaceans or otters.

1.4.2 Basking sharks

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

1.4.3 Pinnipeds

The Marine (Scotland) Act 2010 protects both harbour seal and grey seal around Scotland's coast. This Act provides the Scottish Ministers with the power to designate Seal Conservation Areas. The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) prohibits certain methods of catching or killing seals. The Protection of Seals (Designated of Haul-Out Sites) (Scotland) Order 2014 introduces additional protection for seals at 194 designated haul-out sites, where harbour seal and grey seal come ashore to rest, moult or breed.

1.4.4 Seabirds

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

The proposed development activities are unlikely to result in the intentional or reckless killing of wild birds or the destruction of their nests, but if carried out during the breeding season, such works could result in an offence by disturbing nesting Schedule 1 bird species. Licensing for wild birds does not cover development purposes, so any activity that could result in disturbance of a nesting Schedule 1 species should not proceed unless outwith the breeding season.

1.5 Protected Sites

1.5.1 Natura 2000 Sites

The European Habitats Directive (92/43/EEC) and Birds Directive (79/409/EEC) are transposed into Scottish Law in the terrestrial environment and out to 12 nm by the Habitats Regulations.

European sites protected under this legislation (Natura sites) include Special Protected Areas (SPA), Special Area of Conservation (SAC) and Ramsar sites. 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 *Favourable Conservation Status* (FCS), through the introduction of robust protection for those habitats and species of European importance.

As part of these protection measures, Member States are required to undertake assessments to determine whether a plan or project is likely to have an adverse effect on the integrity of a European site. This is

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

1.5.2 NCMPAs

Under section 82 of the Marine (Scotland) Act 2010, Marine Scotland Licensing Operations Team (MS-LOT) is required to consider whether a licensable activity is capable of affecting (other than insignificantly) a protected feature in a Nature Conservation Marine Protected Area (NCMPA), or any ecological or geomorphological process on which the conservation of any protected feature in an NCMPA is dependent. If MS-LOT determine there is or may be a significant risk of a project hindering the achievement of the conservation objectives, then they must notify the relevant conservation bodies (SNH in this case).

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

1.5.3 Designated Seal Haul-Out

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

1.6 Determining the Need for an EPS Licence

The purpose of the assessments presented in this report is to determine whether, when considering appropriate mitigation as presented in Section 5, there is potential for the cable inspection or marine survey activities to injure or disturb cetaceans, otters or other protected species. Where there is still potential for harm or disturbance to occur, an EPS Licence (or Basking Shark Licence) may be required. The need for an EPS Licence (or Basking Shark Licence) will be determined based on findings from the EPS Risk Assessment. MS-LOT’s consideration of whether an EPS Licence will be required will comprise three tests:

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

1.6.1 What Constitutes Disturbance?

Whether or not a specific activity could cause ‘disturbance’ (for the purpose of Article 12(1) (b) of the Habitats Directive) depends on the nature of the particular activity and the impact on the particular species. Whilst ‘disturbance’ is not defined in the Habitats Regulations, Marine Scotland (2014) advise that the following matters should be taken into account when considering what constitutes disturbance:

- ‘Disturbance’ in Article 12(1) (b) should be interpreted in light of the purpose of the Habitats Directive to which this Article contributes. In particular, Article 2(2) of the Directive provides that measures taken pursuant to the Habitats Directive must be designed to maintain or restore protected species at Favourable Conservation Status[1];

[1] The Habitats Directive defined the conservation status of a species to be taken as 'favourable' when population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, when the natural

- Article 12(1)(b) affords protection specifically to species and not to habitats;
- The prohibition relates to the protection of 'species' not 'specimens of species';
- Although the word 'significant' is omitted from Article 12(1)(b) in relation to the nature of the disturbance, that cannot preclude an assessment of the nature and extent of the negative impact and ultimately a judgement as to whether there is sufficient evidence to constitute prohibited 'disturbance' of the species;
- It is implicit that activity during the period of breeding, rearing, hibernation and migration is more likely to have a sufficient negative impact on the species and constitute prohibited 'disturbance' than activity at other times of the year;
- Article 12(1)(b) is transposed into domestic legislation by Regulation 39(1) and (2) of the Habitats Regulations 1994. Therefore, when considering what constitutes 'disturbance', thought should be given to Regulation 39(1)(b) which provides a number of specific circumstances where an EPS could be disturbed and which can potentially have an impact on the status of the species; and
- Disturbance which could be considered an offence may occur in other circumstances and, therefore, be covered under Regulation 39(2) of the Habitats Regulations which state that it is an offence to 'deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean)'.

Where there is the possibility for injury or disturbance to occur, an EPS Risk Assessment must be carried out and the need for an EPS Licence determined. The injury and disturbance criteria for EPS are described in Section 3.4.1.

1.7 Document structure

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

- Section 2 provides a description of the proposed survey activities and their proposed location;
- Section 3 provides an assessment of the risk to EPS and other protected species;
- Section 4 provides an assessment of potential impacts on protected sites and designated seal haul-outs;
- Section 5 outlines the proposed species protection measures to be implemented; and
- Section 6 presents the overall conclusions of the assessment.
- Appendix A – Table of Cable Routes Coordinates

range of the species is not being reduced for the foreseeable future and there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

2 DESCRIPTION OF PROJECT ACTIVITIES

2.1 Location of Activities

A list of the cable routes for the West Highlands geographical area is given in Section 1.2. The indicative lengths of each cable route are provided in Table 2.1. The co-ordinates for each cable route have been provided in Appendix A – Cable route coordinates. The total survey area covered by the cable routes is 95.3 km^2.

Table 2-1 Cable routes and indicative cable lengths

Cable	Indicative length (km)
Loch a'Choire North	2.0
Loch a'Choire South	2.0
Loch Eil Narrows	0.4
Skye – Scalpay	0.5
Lochaline – Mull	0.9
Lochalsh (Glenelg)	2.1
Corran Narrows Centre	0.7
Corran Narrows North	1.2
Corran Narrows South	0.7
Kyle - Skye North (1)	1.3
Kyle - Skye South (2)	1.8
Loch Sligachan, Skye East (1)	0.4
Loch Sligachan, Skye West (2)	0.4
Skye – Harris	32.2
Skye - South Uist	46.3
Skye Raasay	2.2
Lochaline (Ardtornish)	0.2

2.2 Summary of Project Activities

2.2.1 Overview

Cable surveys will be undertaken to confirm cable position, assess cable condition and provide information to help determine whether any future maintenance or replacement is required (or if there has been any third-party damage). The results of the geophysical survey will be used to inform the future routeing of replacement cables and/or if additional cable protection is required. If the results of the surveys identify cable routes that require maintenance or replacement, these maintenance or replacement activities will be covered under a separate Marine Licence application. As such, any repair, maintenance or installation activities have not been included within this assessment.

2.2.1.1 Testing and Calibration of Survey Equipment

Prior to survey activities commencing, the survey equipment and sensors will need to be tested and calibrated. Testing and calibration may be required for all survey equipment that will be utilised during the survey activity,

as detailed in Table 2-2. It is anticipated that the testing and calibration will take approximately 12 hours per survey campaign.

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 relevant survey corridor. It is however noted that specific bathymetric conditions and features are required to facilitate testing and calibration; where these are not available within the survey corridor, an alternative location will be utilised.

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

2.2.1.2 Geophysical and Geotechnical Surveys

The geophysical surveys will be carried out by two vessels. A typical scenario for their use is considered to be:

- A single large survey vessel will be utilised in the offshore areas; and
- A smaller nearshore survey vessel deployed in shallower waters.

It is however noted that an additional nearshore vessel may be mobilised to meet timing and logistical constraints, hence, up to three survey vessels (one large offshore, and two small nearshore) could be operating simultaneously in the region. Offshore survey operations will be executed on a 24-hour basis by the larger vessel whilst inshore survey operations will be executed on a 12-hour basis (likely daylight working only) by the smaller vessels.

Survey vessel selection and deployment will be informed both prior to and during survey operations 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 2-2 presents the types of activity that are associated with the cable geophysical, geotechnical and environmental surveys

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

Activities	
Vessels and Vehicles	Survey Vessel
	Rigid Inflatable Boat (RIB) / Multicat
	Diving Support Vessel (DSV) (see Section 2.2.3 for example vessels)
	Autonomous Underwater Vessel (AUV)
	Unmanned Aerial Vehicle (UAV)
	Remotely Operated Vehicle (ROV)
	Remotely Operated Towed Vehicle (ROTV)
Geophysical Survey	Ultra-short Baseline (USBL) positioning system
	Side Scan Sonar (SSS)
	Multi Beam Echosounder (MBES)
	Single Beam Echosounder (SBES)
	Sub-bottom profiler (SBP)
	Magnetometer (MAG)
	Cable tracker system
	Subsea altitude metre

Activities	
	Sound velocity profiler (SVP)
	Acoustic Doppler Current Profiler (ADCP)
	Obstacle Avoidance Sonar
Benthic Habitat Analysis	ROV survey / inspection
	Drop-down camera video / photo
	Benthic sediment grab sampling
Geotechnical survey	Vibrocoring / Piezocone Penetration Testing (PCPT)
Landfall area investigations	Landfall topographical survey (note; this is not part of this application as above mean high water spring (MHWS))

Examples of the potential vessels utilised during both inshore and offshore survey activities are provided in Table 2-3 in Section 2.2.2 below.

2.2.2 Vessels and Vehicles

Vessels will be mobilised as required from an agreed mobilisation port depending on which cable or set of cables is being surveyed. As noted above, the type and number of vessels required to complete the geophysical surveys will vary depending on parameters such as cable length and water depth.

The contractors that will be employed to undertake the surveys have not been selected yet, and therefore exact details of the vessels to be used are not available. The vessels detailed in Table 2-3 below are of a similar type and size that could be deployed and have been used as proxy vessels for the purpose of the EPS and Protected Sites Risk Assessment. The vessels detailed go up to the maximum size that could be provided by the contractors, thereby providing the worst-case scenario and offering maximum flexibility in the survey procurement process.

Table 2-3 Example vessels and vehicles that could be used during inspections and surveys

Example vessel / vehicle	Description
Survey	
Vessel for ROV surveys – DP2 vessel	Purpose-designed vessel for ROV surveys, Inspection Repair and Maintenance (IRM) and construction support. Generally, diesel-electric, DP2 vessel that has advanced DGPS, USBL acoustic system and a Seapath 200. Typically, these vessels utilise Launch and Recovery System (LARS). The typical lengths of vessel can be 85 m, breadth 20 m, deck area 630 m^2 and draught 6m.
Multi-purpose vessel – both geophysical and geotechnical survey	Multi-purpose vessel which will typically have diesel-electric propulsion and a specially designed hull. Vessel will be suitable for geophysical and geotechnical survey operations up to 1000m water Depth. Typical length is expected to be 54 m, beam 12.5 m, deck area is 250 m^2 and the draught 3 m.
Multi-purpose DP1 vessel – shallow and medium depth water	Multi-purpose DP1 vessel designed for survey operations in shallow and medium water depths. The vessel will be suitable for geophysical surveys, ROV support operations for up to light Work-Class vehicles, geotechnical CTP and vibrocoring, and environmental surveys. Typical length is expected to be 54 m, beam 12.5 m, deck area is 250 m^2 and the draught 3 m.

Example vessel / vehicle	Description
Vessel for hydrographic and geophysical surveys	Purpose built vessel for hydrographic and geophysical surveys which is typically equipped for 12 hour operations up to 60 nm from save haven. Typical length is expected to be 12 m, beam 5 m and the draught 2 m.
Vessel for geophysical and hydrographic surveys	Geophysical survey equipped with permanently mobilised geophysical and hydrographic survey spreads. Often, this type of vessel has diesel-electric propulsion and specially designed hulls. The equipment of this vessel will include MBES, single beam echosounders, sub bottom profilers and side scan sonar. Typical length of vessel is expected to be 65 m, beam 14 m, deck area is 250 m^2 and the draught 5 m.
Vessel for deep water	Purpose built IMR and ROV vessel, designed for deep water remote intervention, renewables, construction and survey works. Typical length of this type of vessel is expected to be 130 m, breadth 24 m, and draught of 7.5 m.
Unmanned Surface Vehicle (USV)	A 2-3 m long remotely-operated untethered vehicle which floats on the water's surface as a platform of deployment for geophysical survey equipment used in seabed or water column mapping. They are operated using battery power.
Autonomous Underwater Vehicles (AUV)	An unmanned, untethered subsea vehicle which is remotely piloted from a surface operator and are often battery powered.
Remotely Operated Vehicle (ROV)	An unmanned vehicle which is tethered to a vessel/mothership which is powered via electrical cables and hydraulic pumps. ROVs house various instruments, image and sampling equipment used in benthic surveys and, on occasion, some geophysical survey equipment.
Remotely Operated Towed Vehicle (ROTV)	An unmanned towed vehicle used to deploy survey sensors including MBES, MAG, SSS, and SBP.
Unmanned Aerial Vehicle (UAV)	Also known as 'drones,' UAVs are unmanned aircraft deployed for a variety of purposes, including aerial imagery used in surveys.

2.2.3 Survey Techniques

A range of different equipment will be employed during the surveys of the cable routes (see Table 2-2). The survey techniques are described in detail in Table 2-4, below. They have also been assessed for their potential to introduce noise into the marine environment and/or interact with protected species or seabed habitat. The most significant noise related aspects potentially generated by this project are detailed within Table 3-1, along with a determination as to whether each requires further assessment.

Table 2-4 Details of the equipment to be employed for the surveys of the cable routes

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 sensors, 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. In the shallowest regions of the nearshore environment, alternative positioning methods (e.g. layback and position calculations) may need to be considered.
Multi-beam echo-sounder (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. Frequency levels below 200 kHz will not be used during survey activities and have therefore been scoped out of further assessment on the basis that they are outwith the generalised hearing range for EPS and other protected species likely to be affected by underwater noise.
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 (NOAA, 2018). The higher frequency systems provide higher resolution but shorter-range measurements. Frequency levels below 300 kHz will not be used during survey activities and have therefore been scoped out of further assessment on the basis that they are outwith the generalised hearing range for EPS and other protected species likely to be affected by underwater noise.
Single Beam Echosounder (SBES)	Single-beam echo-sounders operate in a similar manner to MBES; rather than measuring multiple points per acoustic echo wave (echo) emitted, SBES can only measure one point at a time. The nature of the sound emitted by SBES is impulsive. The preferred equipment is a Kongsberg EA600.
Sub-Bottom Profilers (SBP)	Sub-bottom profiling / shallow seismic systems are used to identify and characterise layers of sediment or rock 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. SBPs comprise of either pingers or boomers. Pingers operate at a higher frequency but smaller bandwidth than boomers, which operate on a lower

System / survey equipment	Description
	broadband frequency spectrum. The 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. The 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. Parts of the sound pulse from both systems will penetrate the seafloor and be reflected off the different sub-bottom layers, providing data on the sub-floor sediment layers. Unlike the pinger system which has a combined transducer/transceiver deployed in-water from the vessel, the boomer system requires the deployment of a boomer plate and a receiver array that is a separate floating unit from the emission source.
Magnetometer survey (MAG)	Magnetometer surveys are used to detect any ferrous metal objects on the seabed, such as wrecks, unexploded ordinance (UXO), or any other obstructions. Marine magnetometers come in two types: Surface towed and near-bottom. Both are towed a sufficient distance (about two ship lengths) away from the ship to allow them to collect data without it being polluted 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.
Cable tracker system (magnetic)	Various geophysical methods may be used to locate and survey the depth of burial of cables. Passive magnetic and active electromagnetic sensors can be used to detect and track buried cables underwater. With these the depth of burial can be determined through modelling. To access the coverage of underwater cables electromagnetic systems will be used.
Subsea altitude metre	Subsea altitude metres (altimeters) utilise sonar technology to make precision underwater distance measurements by measuring the time it takes for sound pulses to travel from the altimeter to the seafloor and back to the altimeter. The altimeter will be attached to the magnetometer. These devices emit high frequency pulses to measure the distance.
Sound velocity profiler (SVP)	The SVP continuously emits high frequency pulses as it is lowered towards the seafloor in order to measure the speed of sound within the water column. This technology also makes use of sonar to determine how quickly sound attenuates in the marine environment, which can aid in calibrating geophysical survey equipment.
Acoustic Doppler Current Profiler (ADCP)	An ADCP is a hydro-acoustic current meter similar to a sonar, used to measure water current velocities over a depth range using the Doppler effect of sound waves scattered back from particles within the water column. Transducers on the ADCP transmit and receive sound signals in the form of high frequency pulses, and the data is then processed to calculate the Doppler shift, and thus the water velocity along the acoustic beams. ADCPs are generally deployed from a small vessel, using a davit arm, and placed on the seabed where it remains for one lunar cycle, transmitting and recording continuously. To avoid location at the end of the lunar cycle, an acoustic beacon (which lies passively during the survey period) is activated when the vessel returns. An ROV or diver attaches a line and it is then recovered onto the vessel.

System / survey equipment	Description
Obstacle avoidance sonar	High frequency pulses created by obstacle avoidance sonar systems produce sound waves which are used to identify small objects and hazards on the seabed. Higher frequency pulses provide higher resolution imaging.
Geotechnical sampling	
Vibrocoring (with PCPT)	Geotechnical sampling will also be undertaken as part of the marine survey. This may include both vibrocoring operations and Piezocone Penetration Testing[1] (PCPT). Vibrocoring operations will be undertaken using a high power vibrocorer which will be deployed from both the offshore and nearshore vessels. The Piezocone Penetration tests 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 noise. Therefore, this technology does not require any further consideration with respect to possible injury or disturbance to protected species and sites. The USBL system may be used to determine the sampling locations when undertaking vibrocoring and PCPT operations.
Benthic habitat analysis	
ROV survey / Observations	An ROV is a tethered underwater mobile device. ROVs are commonly used for visual surveys of the seafloor. For underwater positioning a USBL system is used. The ROV is manoeuvrable by the use of thrusters.
Drop-down video/ photography	Ground-truthing of acoustic data will be undertaken using drop-down video/photography (drop frame and/or ROV) and grab sampling techniques (see below). This survey technique does not interact with the seabed. Visual surveys are required to provide detail on epifaunal species (animals living on the surface of the substrate), habitats and geological features. The survey methodology will follow the SNH Guidance Notice No. 45 – Subsea Cable and Oil and Gas Pipeline Proposals – Benthic Habitat and Species Survey Requirements and consultation will be undertaken with SNH and Marine Scotland to ensure sufficient sampling frequency.
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

[1] An *in situ* testing method used to determine the geotechnical engineering properties of soils and assessing subsurface stratigraphy, relative density, strength and equilibrium groundwater pressures.

System / survey equipment	Description
	sediment sub-sample will also be retained from the grab for Particle Size Analysis (PSA) with the remainder sieved for infaunal analysis. The survey methodology will follow the SNH Guidance Notice No. 45 – Subsea Cable and Oil and Gas Pipeline Proposals – Benthic Habitat and Species Survey Requirements and consultation will be undertaken with SNH and Marine Scotland to ensure sufficient sampling frequency. The benthic sediment sampling equipment does not generate potentially significant levels of noise. Therefore, this technology does not require any further consideration with respect to potential injury or disturbance of protected species.
Landfall area investigations	
Landfall topographical survey	The intertidal part of the cable route will be inspected by an onshore survey team, using standard topographic survey equipment. This survey activity will include two surveyors carrying the equipment along the beach. The landfall topographic survey technique does not generate potentially significant levels of noise, nor does it interact with the seabed. Therefore, this technology does not require any further consideration with respect to potential noise-generated injury or disturbance of EPS or impacts to protected sites. While the landfall topographical survey will not generate significant levels of noise to generate injury or disturbance to EPS, there is potential for disturbance to semi-aquatic EPS (i.e. otters) from human presence at the landfall sites.

It is recognised that unexploded ordnance (UXO) could, as in many areas, be identified during survey operations. Should UXO be identified, SHEPD will consult with all relevant agencies prior to determining a course of action. No removal or remediation activities would be progressed in advance of such consultation, and SHEPD recognise the potential need for further assessment and licensing should UXO remediation be required.

2.2.4 Activity schedule

Cable route survey activities in the West Highlands marine region are scheduled to be undertaken between 1st November 2019 and 31st March 2023; whilst this is a period of 1,247 days in total, survey activities will be for much shorter durations as detailed below. As described in Section 1.2, applications have already been submitted for licences to undertake the Skye-Harris and Skye-South Uist cable surveys within the period 25th October 2019 to 30th June 2020. The remaining 15 cables are expected to be surveyed in a separate campaign, but with no anticipated increase to the total number of survey vessels that may be operating in the region at any one time.

Vessel presence and survey activities on all (17) cable routes across the West Highlands region are expected to take approximately 51.5 days in total, with an additional 12 hours allowed for equipment calibrations for each survey mobilisation. These durations include allowance for weather downtime, transit between sites and waiting on tides, amounting to approximately 30.8 days in total.

The theoretical minimum duration for a geophysical cable route survey (for the shortest cable) is estimated at 1 hour, with the maximum duration for the longest cable (Skye-South Uist) estimated at 36 hours. The Skye-Harris cable geophysical survey is anticipated to have a duration of 20 hours. With the exception of Skye--Harris and Skye-South Uist, all geophysical cable route surveys have a theoretical duration of 3 hours or less per cable. Video surveys are estimated to require between 1.5 hours and 6.5 days per cable. With the exception of Skye-Harris and Skye-South Uist, all video cable route surveys have a theoretical duration of 9.5 hours or less per cable. These durations do not include any time for deployment and retrieval of the ROV, or any downtime for weather or tides.

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

- 3rd party activities (e.g. fishing, other users);
- Technical equipment issues;
- Environmental mitigation standby; and
- Force majeure.

3 EPS AND OTHER PROTECTED SPECIES RISK ASSESSMENT

3.1 Overview

The primary function of this EPS and other Protected Species Risk Assessment is to identify the potential for injury and disturbance to EPS and other protected species from testing and calibration of geophysical survey equipment and from geophysical surveys across 17 cable routes within the West Highlands marine region. This section of the risk assessment addresses potential impacts to protected species, including 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 – Protected Sites assessment.

A number of different survey activities will be employed as part of the survey works, each with varying risk to protected species. They include:

- Survey equipment calibration testing; and
- Geophysical surveys of seabed.

An overview of survey activities and their potential impacts to protected species is provided in Table 3-1 below. Please note, the duration of activities represents a worst-case scenario in which all cable routes within the West Highlands marine region require surveys prior to 31st March 2023.

Underwater noise emitted by survey vessels and the physical presence of the vessels during the survey period have the potential to cause injury or disturbance to EPS and other protected species.

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

Table 3-1 Overview of potential impacts of marine survey activities on EPS and other protected species within the West Highlands region

Activity / equipment	Potential impacts	Further information required as part of the EPS risk assessment?
Vessels and Vehicles		
Survey & post survey vessels	Propellers, engines, and propulsion activities form the primary noise sources of survey vessels. Vessel noise 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.	**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 West Highlands region does not constitute a 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) (SNH, 2017), as detailed in Section 5.2.
Guard vessels		
RIB / Multicat / DSV		
Unmanned Surface Vehicle (USV)	USVs are controlled and maneuvered using batteries which power propellers and thrusters. Noise generated by USVs is similar to other vessels (i.e. continuous and broadband) but reduced in power due to their smaller size.	**No** – the predominant noise source during USV deployment is the SBP, with the MBES forming a secondary noise source. Both of these survey technologies will mask the sounds generated by the USV and have thus been considered separately (see below).

Activity / equipment	Potential impacts	Further information required as part of the EPS risk assessment?
Autonomous Underwater Vehicles (AUV) Remotely Operated Vehicle (ROV) Remotely Operated Towed Vehicle (ROTV)	Potential impacts to EPS and other marine mammals include disturbance from noise 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 maneuverability and slow movement associated with AUVs, ROVs and ROTVs.	**No** – the predominant noise 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. Noise generated by geophysical survey devices has been considered separately (see below).
Unmanned Aerial Vehicle (UAV)	Disturbance from UAVs may result from noise emissions or visual cues associated with UAV presence, such as its movement or shadow. Flight altitude appears to be the most important factor in determining the behavioural response of marine mammals, including EPS, to UAVs. However, environmental factors, including ambient noise levels and weather (i.e. sunniness), also play an important role in the likelihood of a disturbance event transpiring.	**No** –The source levels associated with the Unmanned Aerial Vehicles (UAV) are too low to result in injury (Christiansen *et al.*, 2016), there remains the potential for a disturbance offence to EPS (Fettermann *et al.*, 2019; Ramos *et al.*, 2018). Dolphins have been observed exhibiting low overall responsiveness to UAVs, which tended to be when they were directly approached or followed by the UAV (Ramos *et al.*, 2018). Dolphin's responses involved investigational behaviour including side-roll and spin-and-orient. The duration of the response was short, and the animals seemed minimally impacted (Ramos *et al.*, 2018). Disturbance responses were observed when UAV's were flown at 10 m altitudes, whereas no significant disturbance was recorded at 25 m or higher (Fettermann *et al.*, 2019). However, UAV surveys will only be conducted at landfall and very nearshore locations, where marine mammals are unlikely to be present.
Geophysical Survey		
Ultra-Low Baseline (USBL) positioning system	USBL systems involve the emission of impulsive sound from a hull-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. The potential impacts of this sound on cetaceans depends upon the abundance, distribution and sensitivity of the species, and the duration of the operations.	**Yes** – The pressure levels and frequencies at which the USBL emit are not of a level where injury is expected, but have the potential to cause disturbance to marine mammals and other protected species.

Activity / equipment	Potential impacts	Further information required as part of the EPS risk assessment?
Side Scan Sonar (SSS)	Side-scan sonar equipment produces impulsive sound emissions through high frequency pulses used to image the seabed habitat. Potential impacts to EPS and other marine mammals depend upon the frequency, location, and duration of the pulses.	**No** – The SSS used for the proposed survey operations will operate at frequencies above 300 kHz. This is above the hearing threshold of all marine mammals and protected species which may be present in the area (as detailed in Table 3-3. Hence no potential for injury or disturbance exists (NOAA, 2018).
Multibeam echosounder (MBES)	High frequency noise pulses created by multi-beam echo sounder equipment generate sound waves which produce impulsive underwater noise. Depending on the frequency of the pulses, location and duration of the operations, and the species present, there could be potential impacts on cetaceans.	**No** – The MBES used for the proposed survey operations will operate at frequencies between 200-400 kHz. This is above the hearing threshold of all marine mammals and protected species which may be present in the area, as detailed in Table 3-3. Hence no potential for injury exists (NOAA, 2018).
Sub-bottom profiling (SBP)	Sub-bottom profiling involves the vertical emission of sound pulses (impulsive noise) to characterise the layers of sediment comprising the seabed. Such activities introduce noise 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. Sparkers are the profiler technology which will be employed during survey activities. They are a type of seismic airgun which use a spark across a pair of electrodes to create a gas bubble whose oscillations generate the sound. This technique will be used to interpret the sub-surface sediment conditions to a minimum depth of 60 m. An UHRS sparker may be used such as the Geo-Source 800. A shallow sub-bottom profiler will also be deployed. The equipment will be either a CHIRP or a pinger.	**Yes** – Although source pressure levels emitted by this equipment been identified as below the threshold to cause potential injury to any marine mammal species, this equipment may be a source of disturbance to marine mammals.
Subsea Altitude Meter	Subsea Altitude Meters, SVPs and ADCPs all rely on high frequency pulsed sounds to gather data on the marine environment. Subsea altimeters use sonar to identify the distance to the seafloor, while SVPs are used to	**No** - the noise source frequencies fall outwith the hearing range of marine mammals. There is no potential for injury or disturbance to any marine mammal species from noise emitted by this equipment.

Activity / equipment	Potential impacts	Further information required as part of the EPS risk assessment?
SVP	measure the speed of sound within the water column to calibrate geophysical survey equipment with. Alternatively, ADCPs emit very high frequency doppler waves and use the back-scatter of those sound waves to measure current speeds and directions within the water column.	**No** - the noise source frequencies fall outwith the hearing range of marine mammals. There is no potential for injury or disturbance to any marine mammal species from noise emitted by this equipment.
ADCP		**No** - the noise source frequencies fall outwith the hearing range of marine mammals. There is no potential for injury or disturbance to any marine mammal species from noise emitted by this equipment.
Obstacle Avoidance Sonar	High frequency pulses created by obstacle avoidance sonars produce high frequency sound waves which can be used to generate high-resolution images of the seabed. As such, there is potential for auditory damage to occur. Nevertheless, the high frequency emissions used by this technology causes sounds to attenuate very quickly and become rapidly lost to the marine environment.	**No** - the noise source frequencies fall outwith the hearing range of marine mammals. There is no potential for injury or disturbance to any marine mammal species from noise emitted by this equipment.

3.2 European Protected Species

3.2.1 Cetaceans

All cetacean species within UK waters are deemed 'species of community interest' under Annex IV of the Habitats directive and thus require strict protection as EPS. Harbour porpoise (*Phocoena phocoena*) and bottlenose dolphin (*Tursiops truncatus*) are listed as individual EPS, while all other cetaceans are listed as "All other cetacea". Cetaceans are also fully protected in Scottish waters under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), while bottlenose dolphin and harbour porpoise have further protection under Annex II of the Habitats directive, which regulates the designation of Special Areas of Conservation (SAC) for those species.

Around 20 species of cetacean have been recorded off the west coast of Scotland, with nine being observed most commonly (HWDT, 2018); harbour porpoise, minke whale (*Balaenoptera acutrostrata*), common dolphin (*Delphinus delphis*), bottlenose dolphin, white-beaked dolphin (*Lagenorhynchus albirostris*), white-sided dolphin *(Lagenorhynchus acutus*), Risso's dolphin (*Grampus griseus*), killer whale (*Orcinus orca*) and humpback whale (*Megaptera novaengliae*) (HWDT, 2018). The following summarises those species regularly sighted within the Project area:

- **Harbour porpoise** is the most abundant cetacean species in the West Highlands marine region and is likely to be present in the vicinity of the project area throughout the year. Sightings in the vicinity of the Isle of Skye peak in June to September (Evans and James, 2017). The Hebridean Whale and Dolphin Trust (HWDT) report many sightings of harbour porpoise in close proximity to the cable routes year-round (HWDT, 2018). In addition, Evans and James (2017) found that some of the highest sightings are in the east of Raasay, which connects to Loch Sligachan (0.02-0.3 sightings/km^2).
- **Bottlenose dolphin** is less common in Scottish offshore waters than inshore waters. Small resident or semi-resident populations occupy a few scattered coastal localities throughout west Scotland, including the Sound of Sleat. The density of bottlenose dolphins is greater in the region comprising

the project area than in most other Scottish coastal waters (Hammond *et al.*, 2017; Reid *et al.*, 2003). Survey data by the HWDT indicate that bottlenose dolphins remain resident in the Inner Hebrides, including northeast Skye, year-round (HWDT, 2018).

- **Minke whale** is the smallest, most prevalent baleen whale to be sighted in Scottish waters (HWDT, 2018). Individuals occupy the Hebridean Sea in elevated numbers and the Inner Hebrides and Minches Special Area of Conservation has been designated for the protection of this species within the region. Northeast Skye and west Skye, surrounding Ramasaig, constitute areas of high sightings rates for this species (HWDT, 2018). Nonetheless, Evans and James (2017) found that minke whales are rarely recorded in the sound of Raasay, adjacent to Loch Sligachan.
- **Common dolphin** are considered an offshore species but have been seen in the Inner Hebrides in increasing numbers over the past decade (HWDT, 2018). Sightings data suggests that this species is a summer visitor to the region, with significantly fewer sightings occurring in the winter months (HWDT, 2018). Across the project area, sightings of common dolphins are low to moderate, except in the deep waters off of Portree, Skye, where very high relative sightings rates have been recorded (0.036-0.095 animals/km) (HWDT, 2018).
- **Other species,** such as killer whales, Risso's dolphins and white-beaked dolphins, are seen infrequently off of west Skye (Ramasaig) in varying numbers (HWDT, 2018). Stranding records of long-finned pilot whales have also been recorded within the region (Evan and James, 2017).

The distribution, density, and abundance of the most commonly occurring cetacean species around the Project area off the west coast of Scotland are described in Table 3-2 below.

Table 3-2 Population parameters of cetacean species potentially present in the project area (Hammond *et al.*, 2017)

Species name	Estimated density across the project area (individuals/km^2)	Estimated abundance within the project area (110 km^2)	Management Unit (MU) / biogeographical population estimate (IAMMWG, 2015)	Proportion of the MU potentially affected by project activities
Harbour porpoise (*Phocoena phocoena*)	0.397	29.2	227,298	0.01%
Bottlenose dolphin (*Tursiops truncatus*)	*Insufficient Data*	*Insufficient Data*	45	*Insufficient Data*
Minke whale (*Balaenoptera acutrostrata*)	0.020	1.5	23,528	0.01%
Common dolphin (*Delphinus delphis*)	0.133*	9.8	56,556	0.02%
Killer whale (*Orcinus orca*)	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*	*Insufficient Data*
Risso's dolphin (*Grampus griseus*)	0.192*	14.1	*Insufficient Data*	*Insufficient Data*
White-beaked dolphin (*Lagenorhynchus albirostris*)	0.053*	3.9	15,895	0.02
Long-finned pilot whale (Globicephala melas)	0.002*	<1	*Insufficient Data*	*Insufficient Data*
* Density estimates are taken from SCANS-III Survey Block I, or from Block J if unavailable.				

3.2.1.1 Potential impacts

Noise emissions constitute the greatest potential risk to cetaceans within the vicinity of the project. Noise has the potential to impact cetaceans and other marine species (see Section 1.4.3) in two ways:

- Injury – physiological damage to auditory or other internal organs; and
- Disturbance (temporary or continuous) – disruptions to behavioural patterns, including, but not limited to: migration, breathing, nursing, breeding, foraging, socialising and / or sheltering. This impact factor does not have the potential to cause injury.

To determine the potential for noise to impact cetaceans, perceived sound levels are compared to available empirically-estimated thresholds for injury and disturbance. Several threshold criteria and methods for determining how sound levels are perceived by marine mammals are available (e.g. the dBht method and other hearing weighted and linear measures) and each has its own advantages and disadvantages. Scottish Government (2014) guidance recommends using the injury and disturbance criteria proposed by Southall *et al.* (2007), which is based on a combination of linear (un-weighted) peak sound pressure levels (SPL) and weighted sound exposure levels (SEL). Since the publication of this seminal paper, there has been mounting evidence of marine mammal auditory abilities in novel species and well-researched species alike (e.g. harbour porpoise) which have led to amendments to the auditory thresholds for injury (NOAA, 2018; Southall *et al.*; 2019). With the advice of SNH, the amended hearing groups and thresholds for acoustic injury have been adopted herein; these are detailed in Section 3.4.1 below.

If a noise emission is composed of frequencies which lie outside the estimated auditory bandwidth for a given species, then disturbance is unlikely. However, noise sources which are sufficiently high can still cause physical damage to hearing and other organs, even when the frequencies lie outside an animal's auditory range. To understand the potential for noise-related impacts, the likely hearing sensitivities of different cetacean hearing groups has been summarised below in Table 3-3 below. Section 3.4 assesses the potential for injury to be incurred for each hearing group, given their estimated auditory bandwidth and the source frequencies of the technology to be deployed.

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

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

3.2.2 Otters

Otters (*Lutra lutra*) are small, semi-aquatic mammals which inhabit riverine, brackish and coastal environments throughout the UK. Although land mammals, otters depend on both freshwater and marine environments for food. Their marine habitat comprises low, peat-covered coastlines with shallow, seaweed rich waters and a consistent freshwater supply (DECC, 2016).

3.2.2.1 Potential impacts

Otters may be present at some of the landfalls of the cable routes during geophysical surveys. The otters may be disturbed by the presence of vessels but are not particularly sensitive to noise. Each cable route survey will only take place of a short period of time in the nearshore area adjacent to the landfalls (i.e. for a period much

shorter than the survey period), and therefore any disturbance will be temporary. Therefore, no adverse impacts to otter are expected.

However, as some level of temporary disturbance is possible, SHEPD will implement appropriate mitigation as outlined in Section 5.

3.3 Other Protected Species

3.3.1 Basking sharks

Basking sharks (*Cetorhinus maximus*) are one of the only three species of shark which filter feed and are the second largest fish in the world (Sims, 2008). This species can be found throughout the offshore waters in the UK continental shelf (Sims, 2008) and are considered frequent visitors to the west coast of Scotland (HWDT, 2018). 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 4 miles per hour). In the winter, they dive to great depths to get plankton while in the summer they are mostly near the surface, where the water is warmer.

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

Basking sharks seasonally arrive on Scottish shores during spring and leave in autumn. They appear to aggregate in summer to breed, with peak numbers in July and August. They are mainly found around the western isles of Scotland, but at certain times can be found in the northern isles or even on the east coast. The NMPi (2019) reports many sightings of basking sharks in the Western Highlands main geographical area and around the isle of Skye.

3.3.1.1 Potential impacts

The basking shark is an elasmobranch (sharks and rays) which is a group with generally low sensitivity to noise vibrations due to the fact they do not have a swim bladder. The hearing range of basking sharks is not known; however, five other elasmobranchs have been found to have a hearing range between 20 Hz to 1 kHz. However, this may or may not be transferable to basking sharks (Macleod *et al.,* 2011). As 20 Hz – 1 kHz only encompass a small proportion of the noise emitted during the proposed geophysical surveys, and the activities are very temporary, noise disturbance is not expected to impact basking sharks. On this basis, the potential for noise emissions to impact upon basking sharks is screened out of further assessment.

Vessel collision also poses a threat to this slow-moving species. Collision risk increases with increasing vessel speed. As the geophysical survey will be moving slowly, collision risk is generally low. Risk will be reduced further on the basis of mitigation measures that SHEPD introduce (Section 5) to alleviate stakeholder concerns.

3.3.2 Seals

Two species of seals inhabit UK waters: the grey seal (*Halichoerus grypus)* and the harbour seal (*Phoca vitulina*). The waters around Scotland are important habitat for both species, which utilise the coastlines and nearshore waters year-round for breeding and feeding (Pollock *et al.,* 2000). The undisturbed coastlines of the west coast of Scotland make excellent habitat for haul-outs, which is why several designated seal haul-outs can be found in this region, as shown in Figure 3.1 and Figure 3.2.

Figure 3.1 Estimated Harbour seals at sea density

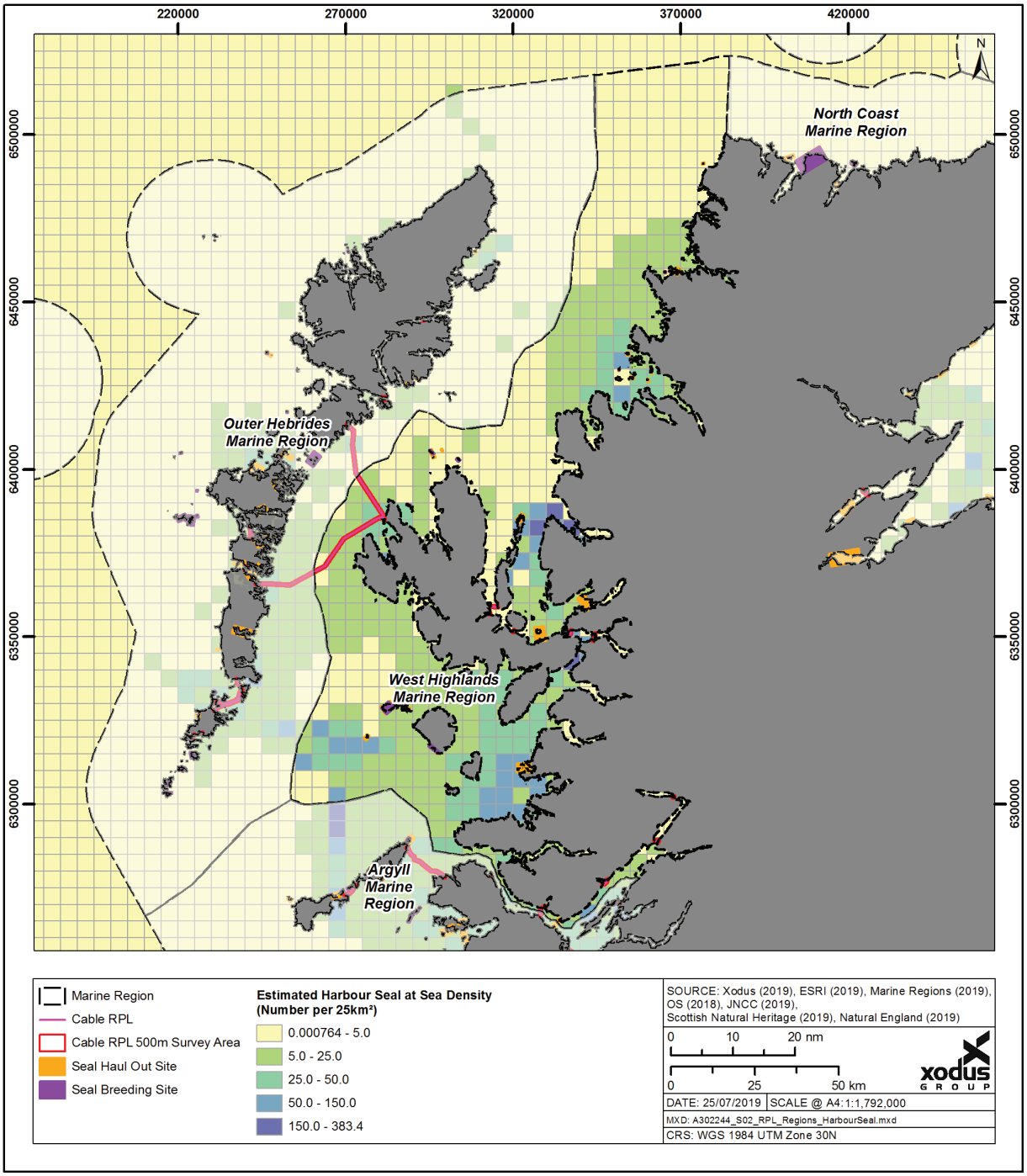
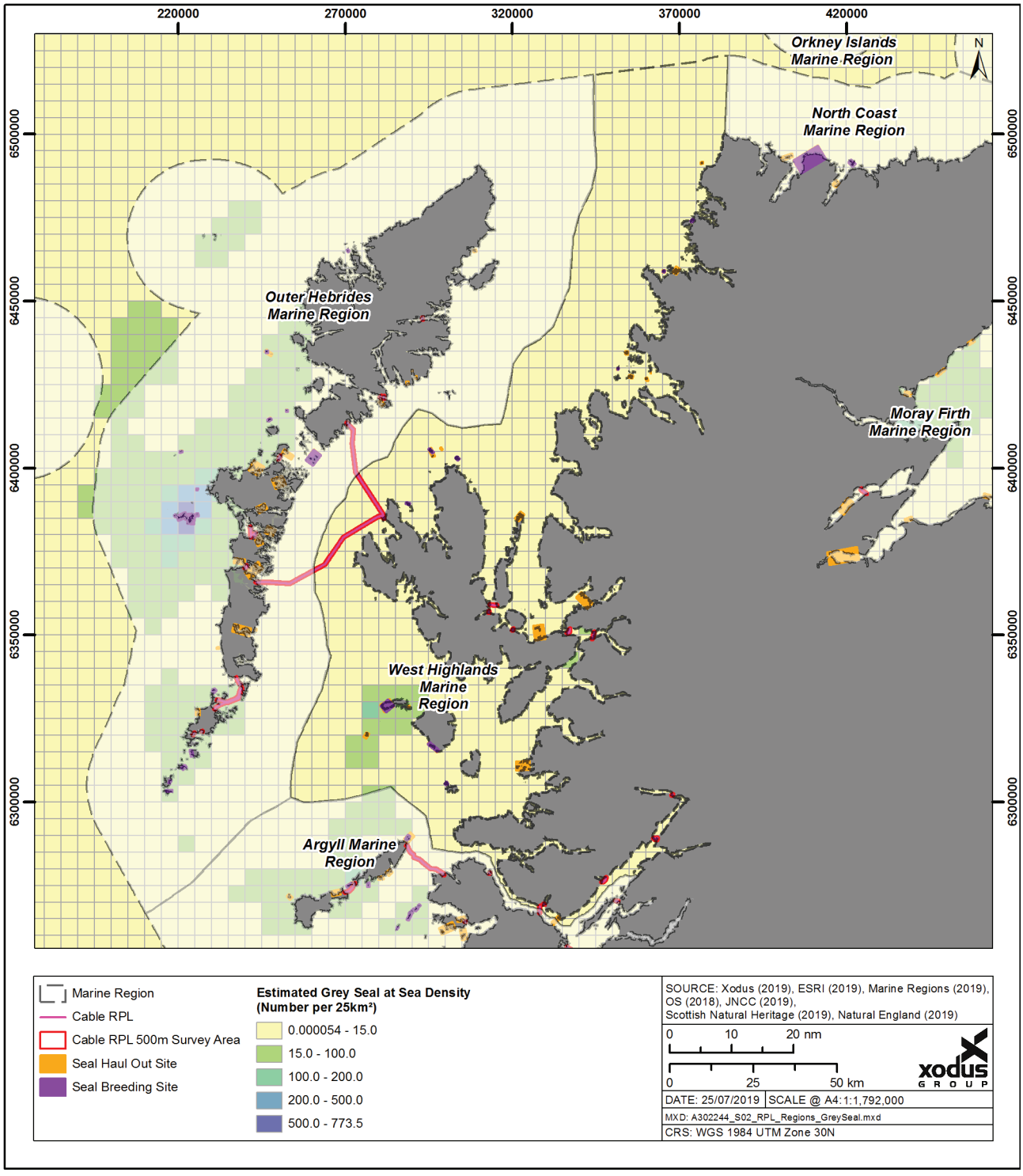


Figure 3.2 Estimated Grey Seals at sea density



The pupping season of harbour seals is June to July and their moulting season occurs in August. Grey seals in Scotland pup thereafter from August/September through to December and then moult until early April (Bowen, 2016; SCOS, 2018). For the west coast of Scotland, pupping is generally September through to October and moulting generally November through to December.

Similar to seabirds, seals are central-place foragers, utilising a terrestrial 'base' for important life history events (i.e. breeding, pupping, moulting, etc.) and to rest, and then head offshore on foraging trips before returning to land (Pollock, 2000). While both species are associated with shallower shelf waters, grey seals often make longer foraging trips to deeper waters than harbour seals (Pollock, 2000). However, neither species regularly occur in waters beyond 200 m (Pollock, 2000). The mean at-sea distribution of harbour seals across the project area is low in comparison to the rest of the North Sea (Russel *et al.*, 2017) whilst the mean at-sea distribution of grey seals in the vicinity of the works is roughly average when compared to the mean distribution across the North Sea (Russel *et al.*, 2017). Conservation regulations covering the protection of grey and harbour seals in UK waters include the Marine (Scotland) Act 2010 and the Conservation (Natural Habitats, &c.) Regulations 1994.

3.3.2.1 Potential impacts

Potential impacts from the testing and calibration of equipment and geophysical surveys may arise from underwater noise generated during the survey activities and physical disturbance at haul-outs (i.e. from vessel or human presence), as outlined in Table 3-1. Seals are particularly susceptible to Project-related impacts during their respective pupping and moulting seasons, when the residency of seals at haul-outs and in surrounding waters elevates the relative density of each species.

Underwater noise emissions have the potential to cause physical injury or disturbance to seals, particularly if they fall within their generalised hearing range of 50 Hz to 86 kHz (NMFS, 2018). However, contemporary data suggests that even with very intense noise emissions, such as those from pile driving activity, harbour seals are likely to return to the region of the noise source once the emissions have ceased (Russell *et al*., 2016). Where this leads to an animal avoiding their main feeding and breeding grounds this can have longer term effects on the health and breeding ability of that animal (Kastelein *et al.,* 2006).

Underwater noise emissions will not result in the killing of seals, for which the two species are protected (Section 1.5.3) and no further assessment of underwater noise in this respect is conducted. Furthermore, the only other protection for seals is against disturbance at haul-outs, which will not occur from underwater noise (since the emissions are, by definition, not airborne). On this basis and considering also the mitigation measures to be adopted from the Project (Section 5), no further assessment of underwater noise is made for seals. However, seals are protected from disturbance at designated haul-outs; such disturbance is considered in the assessment of impacts to protected sites that follows.

3.3.3 Birds

The Scottish marine environment forms vital habitat to a variety of seabird species (Pollock *et al.,* 2000). The west coast of Scotland hosts some particularly important cliff to island nesting seabirds. While the marine environment forms important habitat to sea birds year-round, birds are most vulnerable to human disturbance at sea during the moulting season when they become flightless and spend greater time on the water's surface. The moulting season for the majority of marine birds is after the breeding season, except for puffins (Table 3-4). After the breeding season ends, moulting birds disperse from their coastal colonies to head to offshore waters. This at-sea period increases the likelihood of interactions with survey vessels and the potential collision risk. The important life-history periods for seabird species found in Scotland waters are shown in Table 3-4.

Table 3-4 Breeding seasons and nest occupancy periods of seabirds in Scottish waters (SNH, 2017)

Protected seabird species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Arctic skua												
Arctic tern												
Atlantic puffin		M	M									
Black guillemot								M	M	M	M	
Black-headed gull												
Common eider							M	M	M			
Common guillemot								M	M	M		
Common gull												
Common tern												
Cormorant												
European shag												
Fulmar												
Great black-backed gull												
Great skua												
Kittiwake												
Lesser black-backed gull												
Long-tailed duck												
Northern gannet												
Razorbill								M	M	M	M	
Red-breasted merganser								M	M			
Red-throated diver										M	M	M
Slavonian grebe												
Storm petrel												
Velvet scoter												

Key: Dark Blue = breeding season | White = not present in significant numbers

Blue = breeding site attendance | **M** = flightless moulting period | Light blue = non-breeding period

3.3.3.1 *Potential impacts*

During the proposed activities, the physical presence of vessels may cause disturbance to birds in the Project area. Disturbance from increased vessel light also has the potential to disorientate fledgling birds, leading to collisions with vessels which may be fatal (Rodriguez *et al.,* 2015). The proposed project activities have the potential to take place at any point between November 2019 to March 2023, and therefore have the potential to coincide with the sensitive breeding and moulting periods for birds (Table 3-4). The survey activities are estimated to take up to 16 days in total for the 15 cables within the main West Highlands survey campaign, and an additional 35.5 days for the two longer cable routes (i.e. Skye to Harris and Skye to South Uist).

Despite the potential overlap between the proposed activities and sensitive periods for birds which utilise the marine environment, the temporary nature of the activities, both spatially and temporally preclude them from introducing significant impacts to birds in the area. Finally, vessels will be travelling slowly and in a predetermined pattern over the course of the surveys, which greatly diminishes the likelihood of collisions

occurring. Considering that the seabirds are protected by legislation from harm to individuals, eggs, and nests, no further assessment is conducted herein since these impacts will not occur from the project activities.

Note; impacts on conservation sites within seabird features are considered below in Section 4, and mitigation to control impact on sites protected for seabirds is detailed in Section 5.

3.4 Protected species risk assessment

3.4.1 Protected species assessment criteria

3.4.1.1 Injury

3.4.1.1.1 Acoustic injury criteria

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

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

The geophysical surveys comprise seismic equipment which emits multiple pulsed sound. The Scottish Government (2014) guidance on sound exposure thresholds for noise-related injury to marine mammals uses the thresholds identified by Southall *et al.* (2007) These injury thresholds have since been amended with contemporary acoustics data on marine mammal auditory abilities, as described in the technical note by the U.S. National Oceanic and Atmospheric Administration (NOAA, 2018) and in Southall *et al.* (2019). For this reason, the noise impact assessment herein utilises the contemporary noise impact thresholds as best practice, as advised by SNH.

The noise emitted from the equipment listed above will disperse through the water column, with sound pressure reducing as distance from the noise source increases, therefore marine mammals will be exposed to a lower source pressure further from the noise source. Therefore, for the survey equipment with potential to cause injury to marine mammals, the dispersion of noise through the water column has been modelled to assess the appropriate mitigation zone in which the source pressure levels received by marine mammals are reduced below potentially injurious levels.

A duel-metric approach has been adopted which identifies the range of potential injury to marine mammals from both the peak sound pressure level ($SPL_{rms;}$ also called the source level) and cumulative sound exposure level (SEL) for each equipment type identified to require consideration for noise-related injury (see Table 3-1). The thresholds above which each marine mammal hearing group may experience noise-related injury are presented in Table 3-5 below. These thresholds are derived from measurements of marine mammal hearing using weighting functions which account for peak hearing abilities for each hearing group (NOAA, 2018). The same weighting functions have been applied to the noise modelling approach undertaken in Section 3.4.2.1.

Table 3-5 Criteria considered in this assessment for the onset of injury in marine mammals from impulsive noise (NOAA, 2018; Southall *et al.*, 2019)

Marine mammal hearing group	Impulsive noise		Non-impulsive noise
	Peak pressure (dB re 1 µPa)	Cumulate SEL (dB re 1 μPa^2s)	Cumulate SEL (dB re 1 μPa^2s)
Low-frequency (LF) cetaceans	219	183	199
High-frequency (HF) cetaceans	230	185	198
Very high-frequency (VHF) cetaceans	202	155	173
Phocid pinnipeds (underwater)	218	185	201

3.4.1.2 Disturbance

3.4.1.2.1 Disturbance regulations

There are two regulations which govern disturbances to EPS: Regulation 39(1) and Regulation 39(2). Regulation 39(1) from the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) defines disturbance for all EPS in UK waters and individuals which are vulnerable to disturbance due to biological or environmental circumstances. Regulation 39(2) (for which comparable offence is not found in offshore waters, or in English or Welsh inshore waters) goes beyond the disturbance guidelines provided in Regulation 39(1) by making it an offence to deliberately or recklessly disturb any cetacean in Scottish Territorial Waters (i.e. up to 12 nm) (Marine Scotland, 2014). The definitions of disturbance are provided in Box 1 below.

Box 1 Disturbance regulations in Scottish territorial waters

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

Regulation 39 (1) makes it an offence —

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

(b) deliberately or recklessly –

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

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

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

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

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

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

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

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

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

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

3.4.1.2.2 Acoustic disturbance criteria

Auditory thresholds for disturbance, as defined by NOAA (2018) and Southall *et al.* (2007), have been adopted for the assessment of potential marine mammal disturbance from both non-impulsive and impulsive noise sources. These thresholds, which utilise the behavioural response severity scale detailed in Southall *et al.* (2007) for grading the strength of behavioural responses, are provided in Table 3-6 below.

Table 3-6 Disturbance threshold criteria for impulsive sounds (Southall *et al.*, 2007).

Behavioural Effect	Threshold Criteria SPL_{rms} (dB re 1 µPa)
Potential strong behavioural reaction *(i.e. greater than 7 on the behavioural response severity scale)*	160

3.4.2 Assessment of impacts of activities on protected species

3.4.2.1 Noise impact assessment

3.4.2.1.1 Noise modelling approach

Noise modelling has been undertaken to identify the potential range (i.e. the straight-line distance from the source) in which noise impacts to marine mammals could occur. The duel-metric modelling approach disseminated in NOAA (2018) has been used to identify impacts from: (1) the peak sound pressure level (SPL) from the root-mean-square (rms) pressure level (as SPL_{rms}); and (2) the cumulative sound exposure level (SEL). The SEL represents the total energy produced by a noise-generating activity standardised to a one-second interval. This enables comparison of the total energy attributed to different activities with different inter-pulse intervals. As described in Section 3.4.1.1.1 above, 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 SPL_{rms} has been used for all calculations;
- Maximum pulse length and minimum turn around has been used where provided;
- Where source frequencies occur across a range of frequencies, a flat 3rd octave spectrum has been used;
- Where data is unavailable, the time between pulses has been calculated as 1.5 times the ping length;
- Mammals swim at seabed depths (this represents the worst-case);
- Vessels are moving at slow speeds; and
- Survey equipment likely to be used in the nearshore shallow water environment (i.e. <10 m) will be very high frequency to provide better resolution and will have a lower SPL, and so does not constitute a worst case scenario.

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

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

directly downwards. Due to the frequency-dependent nature of sound, the loss of pressure on the horizontal plane is more pronounced at higher frequencies than at lower frequencies. Directivity corrections can be applied to the model outputs, which provide broadband normalised amplitudes at varying angles of azimuth[2] and dip angle[3]. Directivity corrections have been applied to the modelling outputs under the assumption that the animal is directly in-line with the vessel (i.e. at the 0º azimuth).

3.4.2.1.2 Injury impacts

For the proposed surveys, the expected frequency range for USBL, combined SSS/SBP and SBP operations overlaps with the hearing range of all cetacean hearing groups (Table 3-3). Potential injury to cetaceans (i.e. injury which results from a permanent threshold shift in hearing abilities) is limited to impulsive noise sources which exceed the injury thresholds defined in Table 3-5.

Modelling of ranges at which injury impacts are likely to result from deployment of survey equipment has been undertaken, as described in Section 3.4.1.1. Example equipment has been selected to exemplify the worst-case scenario for each survey technique, including the greatest SPLs across source frequencies meant to encapsulate the hearing abilities of all representative hearing groups. Impacts from noise sources which are strictly behavioural in nature (i.e. disturbance impacts) are covered in Section 3.4.2.1.3.

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

Table 3-7 Noise modelling results for injury impacts from impulsive noise sources (N/E = no exceedance of thresholds)

Activity	Example Equipment Modelled	Depth (m)[4]	Frequency (kHz)	SPL_{rms} (dB re 1µPa)	Injury range (m)											
					Cumulative SEL (Static Mammals)				Cumulative SEL (Moving Mammals)				Peak SPL			
					VHF	HF	LF	PW	VHF	HF	LF	PW	VHF	HF	LF	PW
USBL	1000 Series Mini Beacon, Applied Acoustics Underwater Technology	100	24 - 33.5	200	104	98	73	86	104	56	36	44	24	6	11	11
		10	24 - 33.5	200	12	11	11	11	12	11	11	11	36	10	16	17
SBP/ SSS	EdgeTech 2000 series, combined side scan and sonar and sub-bottom profiling system[5]	100	0.5 - 12	230	40	38	38	38	38	38	38	38	61	3	8	9
		10	0.5 - 12	230	5	4	4	4	5	4	4	4	73	4	13	15
SBP	Innomar SES 2000 sub-bottom profiler, 4 kHz	100	4	235	9	5	9	9	9	5	6	5	255	28	68	73
		10	4	235	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	445	98	178	188
	Innomar SES 2000 sub-bottom profiler, 100 kHz	100	100	235	28	17	17	17	19	17	16	17	30	12	17	18
		10	100	235	N/E	N/E	N/E	N/E	N/E	N/E	N/E	N/E	29	11	16	17

[4] Depth refers to depth below the survey activity, which has been assumed to be hull-mounted or towed at the surface. These depths have been identified as representative of the nearshore and offshore depths in which surveys are likely to occur across the project area, based on available bathymetry data.
[5] For modelling purposes, the specifications of the 2000-CSS have been used.

All of the impulsive survey technologies modelled have the potential to cause injury to EPS and other marine mammals (Table 3-5; Table 3-7). As such, survey activities associated with the project may be potentially injurious to EPS species without appropriate mitigations.

Across modelling scenarios and metrics, the injury ranges were generally highest for the VHF hearing group (Table 3-7), which is represented by harbour porpoise in UK waters. Conversely, HF cetaceans seemed to constitute the hearing group with the lowest potential impact ranges for the peak SPL metric, while LF cetaceans had the lowest impact ranges for the cumulative SEL metric, when comparing between activity types (Table 3-7).

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 on the order of metres to tens of metres for the SBP operating at 100 kHz. The deployment of a hull-mounted USBL in 100 m depths elevated the potential range of impact to a maximum of 104 m for VHFs, when considering cumulative SEL metric. However, the likelihood of a cetacean being this close to operational equipment is extremely low when considering that the source is deployed from a moving vessel travelling at more than 2ms^{-1} (i.e. 4 knots) and, in some cases, is being towed at depth (e.g. a USBL may be mounted on a towed cable plough within a few metres of the seabed).

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

The majority of injury ranges were at least slightly reduced when considering animal movement during cumulative SEL estimation. Swim speeds of the species most likely to be observed in the 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, SNH (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 seal / 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 noise exposure ranges of marine mammals moving away from the sound source, a mean swim speed of 1.5 ms^{-1} has been used in the calculations. Considering that the surveys themselves will take place while the vessel is moving, the cumulative SELs of all equipment types are expected to be even lower based on the premise that animals are likely to move away from the mobile noise source at some angle opposite (i.e. greater than 180°) the direction of travel of the vessel.

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 noise-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 than those defined by the model outputs, thereby reducing the impact ranges associated with the low frequency survey equipment.

Available mitigation measures specifically designed for geophysical surveys (JNCC, 2017) have been incorporated into mitigation measures described in Section 5.2 below. These measures include deployment

of a Marine Mammal Observer (MMO) to monitor for the presence of cetaceans within a 500 m mitigation zone prior to the commencement of, and during, any SBP surveys (JNCC, 2017).

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

3.4.2.1.3 Disturbance impacts

In addition to physical injury, noise emissions have the potential to affect the behaviour of cetaceans in the vicinity of the noise source. Significant or strong disturbance (see Table 3-6; Southall *et al.*, 2007) may occur when an animal is at risk of a sustained or chronic disruption of behaviour or habitat use resulting in population-level effects. An assessment of potential disturbance impacts from impulsive and non-impulsive sound is provided in the Sections below. The outputs of the noise modelling assessment against the disturbance thresholds are provided in Table 3-8 below.

Table 3-8 Noise modelling results for disturbance impacts from impulsive noise sources

Activity	Example Equipment Modelled	Depth (m)	Frequency (kHz)	SPL_{rms} (dB re 1µPa)	Range of Behavioural Change (m)
USBL	1000 Series Mini Beacon, Applied Acoustics Underwater Technology	100	24 - 33.5	200	182
		10	24 - 33.5	200	207
Combined SBP/SSS	EdgeTech 2000 series, combined side scan and sonar and sub-bottom profiling system[6]	100	0.5 - 12	230	3,250
		10	0.5 - 12	230	2,750
SBP	Innomar SES 2000 sub-bottom profiler, 4 kHz	100	4	235	4,220
		10	4	235	3,120
	Innomar SES 2000 sub-bottom profiler, 100 kHz	100	100	235	125
		10	100	235	120

Three types of survey activities have the potential to generate a strong disturbance event (i.e. a disturbance offence) as described in Section 3.4.2.1.2 above; they include: USBL; combined SBP/SSS; and SBP (Table 3-8). 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 noise sources which travel farther within the marine environment. The sounds emitted by the combined SBP/SSS and the SBP operating at 4 kHz form the lowest frequency sounds and have the potential to generate disturbance impacts on the order of several km, whilst those from the USBL and higher frequency (i.e. 100 kHz) SBP are on the order of a couple hundred metres (Table 3-8).

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

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

Species name	Number of individuals which may incur a strong disturbance			Maximum proportion of the MU potentially affected by project activities
	USBL (0.13 km^2 area)	Combined SBP/SSS (33 km^2 area)	SBP – 4kHz[7] (56 km^2 area)	
Harbour porpoise	< 0.1	13.1	22.2	< 0.1%
Minke whale	< 0.1	0.7	1.1	< 0.1%
Common dolphin	< 0.1	4.4	7.5	< 0.1%
White-beaked dolphin	< 0.1	1.7	3.0	< 0.1%

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 Regulations 39(1) or 39(2) (Box 1). However, none of the biogeographical population Management Units (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, less than 0.1% of the relevant biogeographic populations will be impacted by noise-related disturbance (Table 3-9). Moreover, less than a tenth of any cetacean will be potentially disturbed by USBL deployment at any given time, making potential disturbance impacts from this survey equipment negligible.

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

The programme of geophysical surveys will take place *ad hoc*, with the use of survey technologies and vessels being intermittent therein. There will be periods of inactivity during weather downtime and during geotechnical data collection. Given the transient and short-term nature of the survey and vessel activities, it is highly unlikely that any disturbance offences from use of combined SSS/SBP or SBP would negatively impact upon the FCS of any of the cetacean species which may be present in the survey area. This is on the basis that the modelled level of disturbance is unlikely to affect the ability of any individual animal to survive or reproduce, and will not have significant population-level impacts to any EPS (Table 3-9). Regardless, 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 the SBP-related survey activities within 12 nautical miles (as per Regulation 39(2)) (Scottish Government, 2014).

3.4.2.2 Nearshore activities

The taxa which are most likely to be impacted by nearshore activities and at landing points are seals and otters. The potential impact to these species is disturbance from vessel presence and survey activities. Geophysical surveys activities within the intertidal zone have the potential to disturb protected species with varying consequences.

Seals

Although they occupy the marine environment for the majority of the year, grey and harbour seals do utilise the coastal environment during their most sensitive life-history periods; breeding, pupping and moulting. They form breeding colonies and haul-outs for these purposes along rocky, often remote coastlines around the UK, though sometimes colonies may extend onto sandbanks and up cliffs (Nordstrom, 2006). Disturbance at these important terrestrial habitats through vessel presence has the potential to cause acute distress, which may

[7] The Innomar SES 2000 sub-bottom profiler at an operational frequency of 4 kHz has been taken as a worst case.

lead to individuals vacating the site and returning to water. At pupping sites, this behavioural response to stressors has the potential to impact pup survival, as it can disrupt nursing and lead to energetic deficits in pre-weaned pups (NMFS, 2018).

The landfall sites for the cable routes do not include any known grey or harbour seal pupping sites or haul-outs, and activities within the intertidal area will be constrained to the immediate area of landfall. Mitigation measures delineated to minimise impacts to marine mammals, including seals, are set out in Section 5. These include the employment of an MMO who will work with the technical staff to minimise seal encounters during project activities. On this basis, there will be no disturbance of seals at their haul-outs.

Otters

Otters are particularly sensitive to anthropogenic changes to their habitats, as their coastal habitat use is highly dependent on the inclusion of freshwater features (Roos *et al.*, 2015). As such, the location of their holts (or dens) is restricted and anthropogenic changes to their habitat may have dramatic repercussions, including localised extinctions. The existing landfalls do not overlap with areas designated as important otter habitat. Additionally, the temporary nature of any potential activities in the intertidal zone preclude significant impacts to the population from which any otters found within the project areas will belong. Furthermore, none of the proposed activities have the potential to result in the destruction of, damage to, or obstruction of access to an otter holt, or other structure or place it uses for shelter or protection. As such, impacts on otters are expected to be extremely limited, and will not impair an otter's ability to survive, breed or reproduce, or rear or otherwise care for its young, and there will be no adverse impact on the FCS of otters in the region.

Additional mitigation measures for avoiding potential impacts to otters, which will be implemented as a matter of best practice, are presented in Section 5. Considering the extremely limited nature of the potential effects on otters anticipated to result from the proposed survey activities, it is concluded that an EPS licence will not be required for otters.

3.5 Protected species conclusion

3.5.1 Impact to EPS

There will be no injurious impacts to cetaceans or otters as a result of project activities and no requirement to apply for an EPS Licence in that respect, once the proposed mitigation measures are applied (Section 5). However, there is potential for disturbance to cetaceans, and SHEPD will therefore apply for an EPS Licence in respect to disturbance to these. However, this disturbance is expected to be limited to one or a few individuals of a species and will therefore not result in any adverse impact to the FCS of any cetacean species. It is recognised that the risk of disturbance to otters cannot be ruled out, however, the extremely limited nature of this effect will not constitute an offence under the Habitats Regulations, and hence an EPS licence for otters will be not required. The mitigations listed in Section 5 will further minimise any potential disturbance impacts to EPS.

3.5.2 Impact to basking sharks

The potential to impact basking sharks is considered very low and will be reduced further through the implementation of the mitigation measures outlined in Section 5.3. However, as disturbance to basking sharks remains a possibility, an application for a Basking Shark Licence under the Wildlife and Countryside Act 1981 (as amended) will be submitted.

3.5.3 Impact to seabirds

Several seabird species have the potential to be disturbed by the physical presence of vessels during the geophysical survey activities. However, given the temporary and relatively short-term nature of proposed activities, the potential impacts on protected seabirds will not result in killing of individuals or disturbance of eggs and nests, and are therefore not considered to be significant with respect to the Wildlife and Countryside Act (as amended).

3.5.4 Impact to seals

Project activities will not result in the catching or killing or seals, and thus the protection provided to the two species by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) will not be breached.

Furthermore, the short-term and localised nature of the proposed activities, the fact that the activities will occur outside of the important breeding and moulting periods, and that a number of mitigation strategies will also be followed to further reduce any potential impact to seals if any are encountered during the proposed survey operations, all mean that harbour and grey seals making use of protected haul-outs will not be significantly disturbed. As such, the protection given by the Protection of Seals (Designation of Haul-Out Sites) (Scotland) 2014 will also not be breached.

3.5.5 Final conclusion

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

4 PROTECTED SITES ASSESSMENT

4.1 Selection criteria for assessment of protected sites

Over and above potential impacts on protected species, the potential for the cable geophysical surveys to impact protected sites (including seal haul-outs) needs to be considered. For each of the cable routes the following criteria has been used to select those designated 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 geophysical surveys;
- SACs (including proposed and candidate sites) with harbour seal interests within 50 km of the proposed survey area and breeding grey seal within 20 km of the proposed survey area;
- Designated seal haul-outs or grey seal breeding sites that overlap with or located within 500 m of the proposed survey area;
- SACs and NCMPAs (including proposed and candidate sites) with otter interests that overlap with or located within 500 m of the proposed survey area;
- SPAs and NCMPAs (including proposed and candidate site) with birds as qualifying features that overlap with or are located within 2 km of the proposed survey area.
- SACs and NCMPAs (including proposed and candidate sites) with seabed / benthic protected features that overlap with the proposed survey area.

The designated sites located in the vicinity of the cable routes which have the potential to be impacted by cable survey activities subject to the selection criteria above are outlined in Table 4-1 and shown in Figure 4.1 and Figure 4.2. For each designated site that has the potential to be impacted by the surveys, mitigation measures have been considered based upon site-specific protected features and these are also included within Table 4-1. Details of the mitigation measures are provided in Section 5. (Note: Some of the mitigation measures included in Section 5 may not be listed in Table 4-1 if they are not related to protecting designated features of those sites. However, all mitigation measures in Section 5 will be applied to all activities, regardless of proximity to a protected site).

Table 4-1 Protected sites in the vicinity of cable survey corridors

Cable name	Designated site potentially affected	Survey corridor overlaps with protected site or is within site selection criteria distance to protected site	Distance from nearest part of survey corridor to protected site (km)	Features of designated site (those marked *potentially most likely to be affected, PR=primary reason for selection)	Activity	Duration of activities within site selection criteria distance to protected site (days)	Proposed mitigation measures	Potential for likely significant effect
Loch a'Choire North	Eileanan agus Sgeiran Lios mor SAC	The designated site is within 50 km of the cable route.	3.39	Harbour seal *Phoca vitulina*	Vessel presence, geophysical and video surveys	< 1	M1, M2, M3, M4, M6, M7	No
	Inner Hebrides and the Minches cSAC	The designated site is within 50 km of the cable route	7.6	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is within 50 km of the cable route	34.2	Basking shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
Loch a'Choire South	Eileanan agus Sgeiran Lios mor SAC	The designated site is within 50 km of the cable route	3.35	Harbour seal *Phoca vitulina*	Vessel presence, geophysical and video surveys	< 1	M1, M2, M3, M4, M6, M7	No
	Inner Hebrides and the Minches cSAC	The designated site is within 50 km of the cable route	7.58	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7	No
	Sea of the Hebrides pMPA	The designated site is within 50 km of the cable route	34.3	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
Loch Eil Narrows	Inner Hebrides and the Minches cSAC	The designated site is within 50 km of the cable route	33.68	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys	< 1	M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is within 50 km of the cable route.	45.7	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
Skye - Scalpay	Inner Hebrides and the Minches cSAC	The designated site overlaps with the cable route.	0	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys	< 1	M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is located within 50 km of the cable route	21.4	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
	Cuillins SPA	The designated site is within 2 km of the cable route	0	Golden Eagle *Aquila chrysaetos*	Vessel presence, geophysical and video surveys		M12, M13, M14, M15	No
Lochaline - Mull	Eileanan agus Sgeiran Lios mor SAC	The designated site is within 50 km of the cable route	11.3	Harbour seal *Phoca vitulina*	Vessel presence, geophysical and video surveys	< 1	M1, M2, M3, M4, M6, M7	No
	Inner Hebrides and the Minches cSAC	The designated site overlaps with the cable route	0	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is located within 50 km of the cable route	47.5	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No

Cable name	Designated site potentially affected	Survey corridor overlaps with protected site or is within site selection criteria distance to protected site	Distance from nearest part of survey corridor to protected site (km)	Features of designated site (those marked *potentially most likely to be affected, PR=primary reason for selection)	Activity	Duration of activities within site selection criteria distance to protected site (days)	Proposed mitigation measures	Potential for likely significant effect
Lochalsh (Glenelg)	Inner Hebrides and the Minches cSAC	The designated site is located within 50 km of the cable route	0.1	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys	< 1	M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is located within 50 km of the cable route	36.4	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
	Lochs Duich, Long and Alsh Reefs SAC	The designated site overlaps with the cable route.	0	Reefs	Vessel presence, geophysical and video surveys		N/A	No
Corran Narrows Centre	Eileanan agus Sgeiran Lios mor SAC	The designated site is located within 50 km of the cable route	18.6	Harbour seal *Phoca vitulina*	Vessel presence, geophysical and video surveys	<1	M1, M2, M3, M4, M6, M7	No
	Inner Hebrides and the Minches cSAC	The designated site is located within 50 km of the cable route	25	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is located within 50 km of the cable route	43.6	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
	Moidart and Ardgour SPA	The designated site is within 2 km of the cable route.	0.9	Golden Eagle *Aquila chrysaetos*	Vessel presence, geophysical and video surveys		M12, M13, M14, M15	No
Corran Narrows North	Eileanan agus Sgeiran Lios mor SAC	The designated site is within 50 km of the cable route	18.6	Harbour seal *Phoca vitulina*	Vessel presence, geophysical and video surveys	<1	M1, M2, M3, M4, M6, M7	No
	Inner Hebrides and the Minches cSAC	The designated site is within 50 km of the cable route.	24.6	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is within 50 km of the cable route.	43.2	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
	Moidart and Ardgour SPA	The designated site is within 2 km of the cable route.	0.5	Golden Eagle *Aquila chrysaetos*	Vessel presence, geophysical and video surveys		M12, M13, M14, M15	No
Corran Narrows South	Eileanan agus Sgeiran Lios mor SAC	The designated site is within 50 km of the cable route	18.6	Harbour seal *Phoca vitulina*	Vessel presence, geophysical and video surveys	<1	M1, M2, M3, M4, M6, M7	No
	Inner Hebrides and the Minches cSAC	The designated site is within 50 km of the cable route.	24.5	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is within 50 km of the cable route.	43.6	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
	Moidart and Ardgour SPA	The designated site is within 2 km of the cable route.	1	Golden Eagle *Aquila chrysaetos*	Vessel presence, geophysical and video surveys		M12, M13, M14, M15	No

Cable name	Designated site potentially affected	Survey corridor overlaps with protected site or is within site selection criteria distance to protected site	Distance from nearest part of survey corridor to protected site (km)	Features of designated site (those marked *potentially most likely to be affected, PR=primary reason for selection)	Activity	Duration of activities within site selection criteria distance to protected site (days)	Proposed mitigation measures	Potential for likely significant effect
Kyle - Skye North (1)	Inner Hebrides and the Minches cSAC.	The designated site overlaps with the cable route.	0	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys	<1	M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is within 50 km of the cable route.	31.9	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
	Lochs Duich, Long and Alsh MPA	The designated site overlaps with the cable route	0	Reefs	Vessel presence, geophysical and video surveys		N/A	No
Kyle - Skye South (2)	Inner Hebrides and the Minches cSAC	The designated site overlaps the cable route.	0	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is located within 50 km of the cable route	31.8	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
	Lochs, Duich, Long and Alsh MPA	The designated site overlaps with the cable route.	0	Reefs	Vessel presence, geophysical and video surveys		N/A	No
Loch Sligachan, Skye East (1)	Inner Hebrides and the Minches cSAC	The designated site is located within 50 km of the cable route	0	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys	<1	M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is located within 50 km of the cable route.	20.8	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
	Cuillins SPA	The designated site is located within 2 km of the cable route	0	Golden Eagle *Aquila chrysaetos*	Vessel presence, geophysical and video surveys		M12, M13, M14, M15	No
Loch Sligachan, Skye West (2)	Inner Hebrides and the Minches cSAC	The designated site is located within 50 km of the cable route.	0	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys	<1	M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is located within 50 of the cable route.	20.8	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
	Cuillins SPA	The designated site is located within 2 km of the cable route.	0	Golden Eagle *Aquila chrysaetos*	Vessel presence, geophysical and video surveys		M12, M13, M14, M15	No
Skye - Harris	Ascrib, Islay and Dunvegan SAC	The designated site is located within 50 km of the cable route.	1.9	Harbour seal *Phoca vitulina*	Vessel presence, geophysical and video surveys	5.5	M1, M2, M3, M4, M6, M7	No
	Inner Hebrides and the Minches cSAC	The designated site overlaps with the cable route.	0	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys	5.5	M1, M2, M3, M4, M6, M7	No
	North-east Lewis pMPA	The designated site is located within 50 km of the cable route.	43.3	Risso's dolphin *Grampus griseus* (PR)	Vessel presence, geophysical and video surveys	1.7	M1, M2, M3, M4, M6, M7	No

Cable name	Designated site potentially affected	Survey corridor overlaps with protected site or is within site selection criteria distance to protected site	Distance from nearest part of survey corridor to protected site (km)	Features of designated site (those marked *potentially most likely to be affected, PR=primary reason for selection)	Activity	Duration of activities within site selection criteria distance to protected site (days)	Proposed mitigation measures	Potential for likely significant effect
	Sea of Hebrides pMPA	The designated site is located within 50 km of the cable route	5.4	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys	5.5	M1, M2, M3, M4, M6, M7, M8, M9	No
Skye - South Uist	Ascrib, Islay and Dunvegan SAC	The designated site is located within 50 km of the cable route.	1.8	Harbour seal *Phoca vitulina*	Vessel presence, geophysical and video surveys	8.13	M1, M2, M3, M4, M6, M7	No
	Sound of Barra cSAC	The designated site is located within 50 km of the cable route.	27.9	Harbour seal *Phoca vitulina*	Vessel presence, geophysical and video surveys	5.46	M1, M2, M3, M4, M6, M7	No
	Inner Hebrides and the Minches cSAC	The designated site overlaps with the cable route	0	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys	8.13	M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site overlaps with the cable route	0	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys	8.13	M1, M2, M3, M4, M6, M7, M8, M9	No
Skye Raasay	Inner Hebrides and the Minches cSAC	The designated site overlaps with the cable route	0	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys	<1	M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is located within 50 km of the cable route.	22.7	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No
	Cuillins SPA	The designated site is 1.9 km from the cable route.	1.9	Golden Eagle *Aquila chrysaetos*	Vessel presence, geophysical and video surveys		M12, M13, M14, M15	No
Lochaline (Ardtornish)	Eileanan agus Sgeiran Lios mor SAC	The designated site is located within 50 km of the cable route	11	Harbour seal *Phoca vitulina*	Vessel presence, geophysical and video surveys	<1	M1, M2, M3, M4, M6, M7	No
	Inner Hebrides and the Minches cSAC	The designated site is located within 50 km of the cable route.	0	Harbour porpoise *Phocoena phocoena*	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7	No
	Sea of Hebrides pMPA	The designated site is located within 50 km of the cable route.	25	Basking Shark *Cetorhinus maximus* Minke Whale *Balaenoptera acutorostrata* (PR)	Vessel presence, geophysical and video surveys		M1, M2, M3, M4, M6, M7, M8, M9	No

Figure 4.1 West Highlands Protected Sites (northern part of the region)

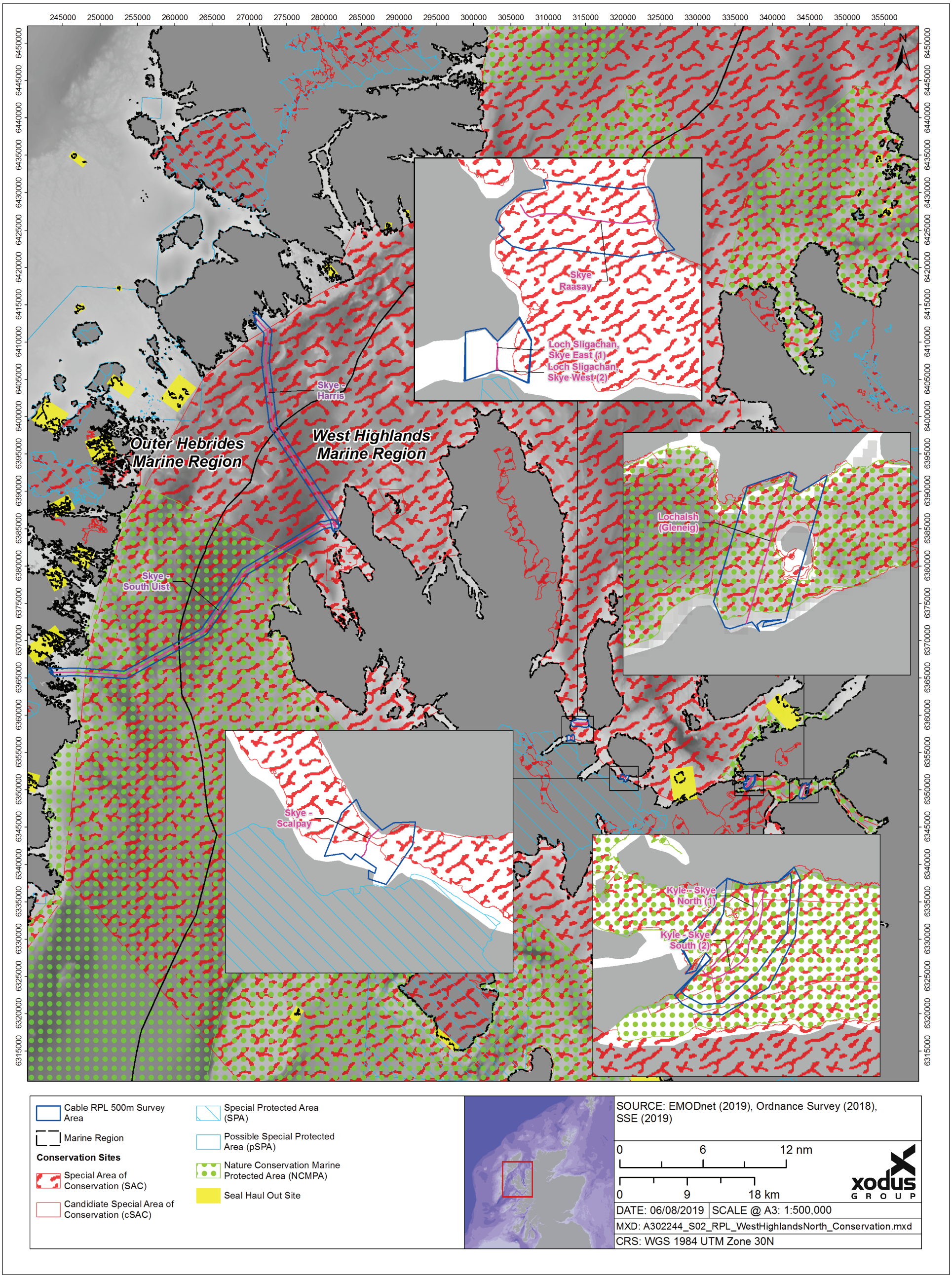
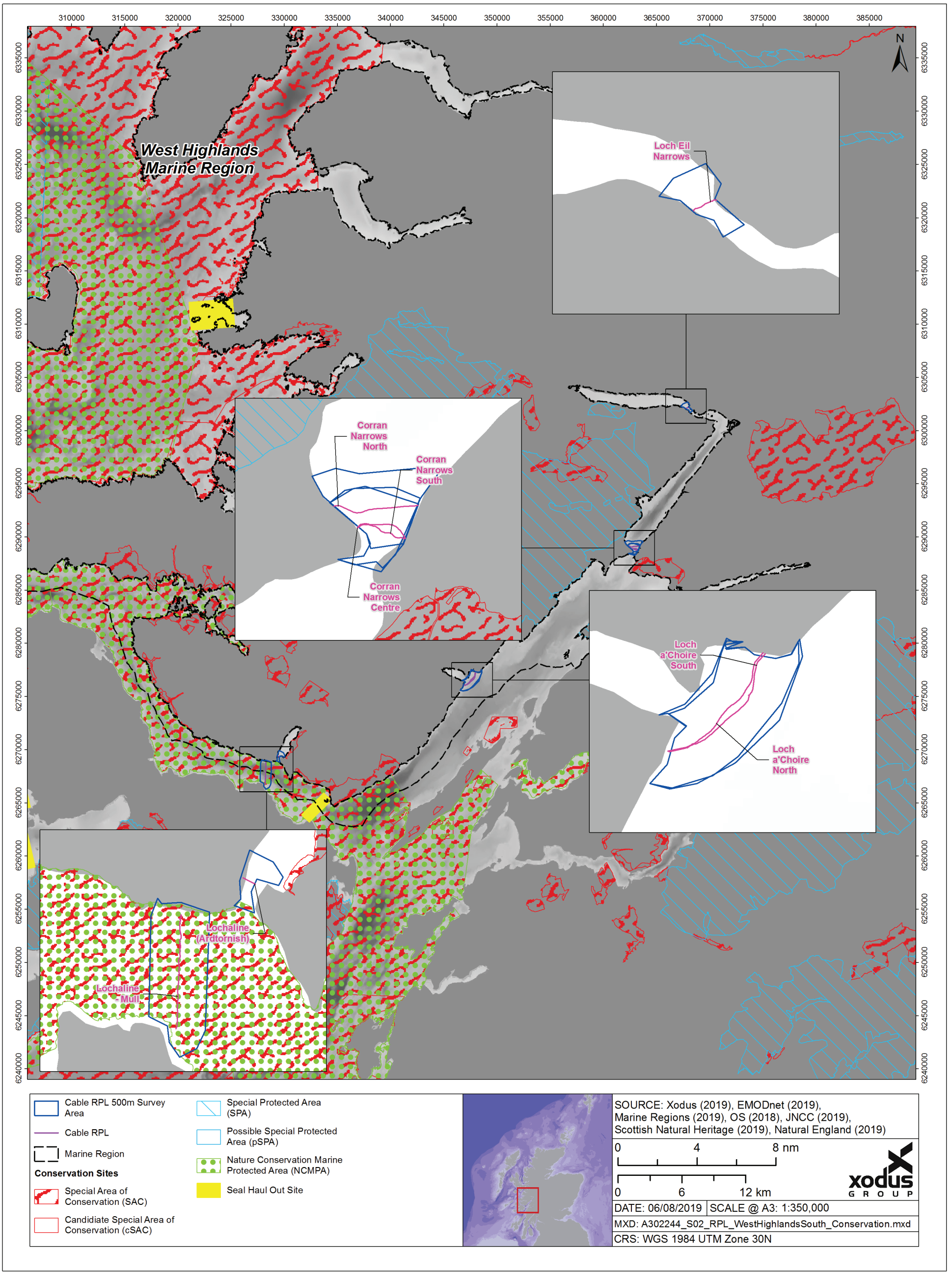


Figure 4.2 West Highlands Protected Sites (southern part of the region)



4.2 Conclusion of protected site assessment

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

4.2.1 Potential impact on SACs with seals as a feature and seal haul-out sites

There are eight cable routes which are located within 50 km of the Eileanan agus Sgeiran Lios mor SAC (JNCC 2019a); a site designated for Harbour Seal. There are two cable routes which are located within 50 km of the Ascrib, Islay and Dunvegan SAC (JNCC, 2019b) and the Sound of Barra cSAC (JNCC, 2019c); both sites are designated for Harbour Seal.

The cable routes within the West Highlands geographical area are not within 500 m of a seal haul-out or seal breeding site.

Harbour seals are most sensitive to impact during the pupping and moulting season which occurs between June to early July. The proposed activities, which include calibration tests and geophysical surveys will be carried out sometime between 1st November 2019 to 31st March 2023 and could coincide with the sensitive periods for harbour seal. However, due to the short duration of the proposed activities close or within the sites, it is considered that no adverse impact is expected on harbour seals during these activities.

A number of mitigation strategies will also be followed to further reduce any potential impact on seals, as provided in Section 5.

4.2.2 Potential impact on SACs with highly mobile megafauna (i.e. cetaceans and basking shark) as a feature

All of the West Highlands marine region cable routes are located within 50 km of the Inner Hebrides and the Minches cSAC (JNCC, 2019d). The Inner Hebrides and the Minches cSAC is designated for Harbour porpoise. The West Highlands cable routes are also located within 50 km of the Sea of Hebrides pMPA (JNCC, 2019e); a site designated for Basking Sharks and minke whale. There is one cable route located within 50 km of the North-east Lewis pMPA (JNCC, 2019f); a site designated for Risso's dolphin.

As stated in Section 3.5.5, there will be no injurious impacts to cetaceans from the activities, and the potential to impact basking sharks is considered to be very low. Although the West Highlands marine region cable routes are within 50 km of, and overlap with, several SACs with highly mobile megafauna species as designated features, due to the relatively short, temporal aspect of each cable survey, as well as the implementation measures outlined in the MMMP (see section 5), no adverse impact upon the conservation status of the designated sites is expected.

A full assessment of the potential impact on cetaceans from the cable inspection and survey activity is provided in Section 3.

4.2.3 Potential impact on SACs and MPAs with benthic features

There are two cable routes that overlap with the Lochs Duich, Long and Alsh Reefs SAC; a site designated for reefs.

The Project activities that have the potential to interact with the seabed include benthic sediment sampling and vibrocoring (with PCPT). Given the relatively small volume of sediment which will be extracted during the sampling activity, as well as the relatively small area of sediment that will be impacted during PCPT activities will not have a significant impact on the integrity of the Lochs Duich, Long and Alsh Reefs SAC.

4.2.4 Potential impact on SPAs

4.2.4.1 Cuillins SPA

The Cuillins SPA (JNCC, 2019g) is located on the island of Skye. It is a large, predominantly upland site rising from sea level to over 900 m. It encompasses a diverse range of habitats including heather moorland, rough grassland, blanket bog and exposed rock and scree.

The site qualifies under Article 4.1 of the Directive (79/409/EEC) by supporting the following population of European importance; Golden Eagle *Auila chrysaetos* during the breeding season. Golden eagles could potentially range relatively far distances; however they have been observed to stay within a 9 km radius of their home-range. They feed predominantly on medium sized birds and mammals including hares and rabbits.

Three cable routes are located within 2 km of the designated site; Loch Sligachan, Skye West (2), Loch Sligachan, Skye East (1), and Skye – Scalpay. For each of these cable routes, the proposed activities could comprise of testing and calibration of equipment, and geophysical and video surveys. Survey activities on these three cables (including deployment and retrieval of the ROV) are likely to take up to 7.5 hours per cable.

As Golden eagles feed on predominantly terrestrial animals, they are unlikely to be impacted by the geophysical surveys during foraging activities. The temporary and localised nature of the geophysical surveys are unlikely to significant effect on populations of Golden eagles and therefore no adverse impact is expected on the conservation status of the Cuillins SPA.

4.2.4.2 Moidart and Ardgour SPA

The Moidart and Ardgour SPA (JNCC, 2019h) is a large, predominantly upland site in the Western Highlands of Scotland. The site encompasses a diverse range of habitats including heather moorland, rough grassland, blanket bog, and native woodland. There are also numerous freshwater lochs and river systems.

The site qualifies under Article 4.1 of the Directive (79/409/EEC) by regularly supporting a population of European importance; Golden eagle. Golden eagles could potentially range relatively far distances; however they have been observed to stay within a 9 km radius of their home-range. They feed predominantly on medium sized birds and mammals including hares and rabbits.

Three cable routes are located within 2 km of the designated site; Corran Narrows North, Corran Narrows Centre, and Corran Narrows South. For each cable route, the proposed activities could comprise of inspections and repair works.

The survey activities on these three cables (including deployment and retrieval of the ROV) are likely to take between 8.5 hours and 12 hours per cable.

As Golden eagles feed on predominantly terrestrial animals, they are unlikely to be impacted by the geophysical surveys during foraging activities. The temporary and localised nature of the geophysical surveys, are unlikely to significant effect on populations of Golden eagles and therefore no adverse impact is expected on the conservation status of the Moidart and Ardgour SPA.

4.2.5 Conclusion

The equipment calibration testing will take up to 12 hours per survey mobilisation, and geophysical and video surveys will take approximately 16 days in total for the 15 cables within the main West Highlands survey campaign. The survey activities along the Skye to Harris and Skye to South Uist cable routes are expected to take approximately 35.5 days in total across the two routes. These durations allow for periods of stand-by due to a range of factors and as such, are likely to be conservative in nature, hence the actual survey duration may be shorter. It is unlikely that cable routes within the same region will require geophysical surveys to occur concurrently.

The proposed West Highlands works will occur sometime between November 2019 and March 2023, noting that until the West Highlands licences are granted, the Skye-Harris and Skye-South Uist survey activities will be covered under a separate licence application due to the requirement for the survey activities to commence in October 2019. As such, the activities have the potential to coincide with the breeding periods of Golden eagles, as well as breeding and pupping seasons for Harbour seals. However, given the relatively short-term

nature of the surveys across the majority of cable routes across a long period of time, as well as the transient nature of the project activities it is considered unlikely that the proposed works will impact significantly upon breeding birds and seals. No adverse impact is expected on the conservation status of qualifying species of the designated sites.

A conclusion on the assessment of potential impacts on cetaceans from the equipment calibration testing and geophysical survey works is provided in Section 3.

Due to the temporary and localised nature of the proposed activities within the overall survey window and the mitigation measures outlined in Section 5, no significant impact is anticipated on the conservation objectives of any protected site. Overall, the monitoring of submarine power cables constitutes work of an overriding public need whilst presenting a trivial and temporary disturbance in a limited area.

5 SPECIES PROTECTION MEASURES

5.1 Overview

This section summarises the proposed mitigation measures to be implemented for avoiding and reducing potential impacts on species that may be present in the vicinity of the cable inspections and any required 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 (SNH, 2017), and the Basking Shark Code of Conduct (MSC, undated); and
- Survey crew will be made aware of all protected species within the marine environment, and their responsibility to implement the mitigation in this document.

5.2 Marine Mammals

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 the SBP is not capable of performing a soft-start, and hence this procedure is not included. The key components of the MMPP for SBP include:

- Deployment of a MMO to monitor for the presence of cetaceans and seals, prior to the commencement of SBP operations;
- For SBP operations during hours of darkness and/or in periods of poor visibility and/or during periods when the sea state is greater than Beaufort 3, deployment of Passive Acoustic Monitoring (PAM) system to detect for the presence of cetaceans that cannot be detected by the MMO;
- 500 m mitigation zone for cetaceans;
- 500 m mitigation zone for seals, reducing to 100 m in the event of a need to avoid critical delay to the project; and
- Reporting.

5.2.1 M1 – Marine mammal monitoring

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

5.2.2 M2 – Marine Mammal Observer (MMO)

During daylight hours the MMO(s) will carry out visual observations to monitor for the presence of cetaceans, seals and basking sharks before the SBP is activated and will recommend delays in the commencement of the operation should any cetaceans be detected within the 500 m mitigation zone for cetaceans. This distance will be 500 m for seals and basking sharks, except in the event of a need to avoid critical delay to the project in which case the mitigation zone for both species groups will be 100 m. The criteria as to what constitutes a critical delay leading to reduction in mitigation zone distance from 500 m to 100 m would be agreed on a case by case basis in consultation with MS-LOT.

5.2.3 M3 – Passive Acoustic Monitoring (PAM)

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 Code 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).

5.2.4 M4 – Pre-start search

Visual (MMO) (and acoustic (PAM) monitoring if required) will be conducted for a pre-start search of 30 minutes i.e. prior to the commencement of SBP operations. This will involve a visual (during daylight hours) or PAM watch (during poor visibility or at night) to determine if any cetaceans, seals or basking sharks are within 500 m of the activities (or 100 m in the event of the critical delay described in mitigation measure M2).

5.2.5 M5 – Designated seal haul-outs

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

5.2.6 M6 – Cetacean, seal and basking shark mitigation zone

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

As outlined in mitigation measure M2, the mitigation zone for seals and basking sharks may be reduced from 500 m to 100 m in the event of a need to avoid critical delay to the project, subject to agreement with MS-LOT.

5.2.7 M7 – Reporting

All recordings of cetaceans, seals and basking sharks 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 Marine Scotland and SNH. The report will also include feedback on how successful the mitigation measures were. This requirement will be communicated to the MMOs at project start up meetings and at crew change.

5.3 Basking shark

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

5.3.1 M8 – Basking shark monitoring

There will be MMO coverage for the duration of the marine activities, with adequately trained and experienced MMO(s) working standard 12 hour shifts. The MMO will also monitor for the presence of basking shark following the mitigation measures described above for Marine Mammal Monitoring (see 5.2.1). Should any basking sharks be detected within 500 m of the vessel prior to the commencement of SBP surveys (or after breaks in geophysical survey activity of more than 10 minutes), operations will be delayed until their passage, or the transit of the vessel, results in the animals being outwith the mitigation zone. In all cases, there will be a 20 minute delay from the time of the last sighting within mitigation zone to the commencement/recommencement of the operations.

5.3.2 M9 – Basking shark mitigation zone

During survey works, the MMO will monitor for the presence of basking sharks, in addition to marine mammals and otters, and will delay start of the survey if any are seen within 500 m of the survey vessel. The mitigation zone for basking sharks may be reduced from 500 m to 100 m in the event of a need to avoid critical delay to the project subject to agreement with MS-LOT.

5.4 Otters

The following mitigation measures will be implemented during SBP operations in order to reduce disturbance to otters:

5.4.1 M10 – Otter monitoring

There will be MMO coverage for the duration of the SBP survey operations, with adequately trained and experienced MMO(s) working standard 12 hour shifts. The MMO will also monitor for the presence of otters (see also Section 5.2.1 Mitigation Measure M1).

5.4.2 M11 – Otter mitigation zone

When working within 500 m of any SAC designated for otters, the MMO monitors for the presence of otters in the water in addition to marine mammals and basking sharks and delays the start of the survey if any are seen within 200 m of the survey vessel. If working during the hours of darkness or in poor visibility when the MMO is not able to monitor otters, the SBP will not be started within 200 m of a SAC designated for otters. Instead the SBP will be started outwith this distance, and the vessel then moved into position once the SBP is sounding.

5.5 Seabirds

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

5.5.1 M12 – Rafting seabirds

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

5.5.2 M13 – Wintering birds

When within a SPA which has been designated for wintering birds that may roost or feed in close proximity to the cable survey corridor or the landfall, further consultation will be undertaken with SNH on the requirement for any seasonal restriction to be implemented for cable inspections or survey activities in order to avoid disturbance to qualifying species during the most sensitive time of the year.

5.5.3 M14 – Breeding birds

When within a SPA which has been designated for breeding birds that may nest or feed in close proximity to the cable survey corridor or the landfall, further consultation will be undertaken with SNH on the requirement for any seasonal restriction to be implemented for equipment calibration and testing, as well as geophysical survey activities in order to avoid disturbance to qualifying species during the most sensitive time of the year.

5.5.4 M15 – Light disturbance

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

- Lighting on-board the cable survey vessel(s) will be kept to the minimum level required to ensure safe operations; and

- Lights will be directed or shielded to prevent upward illumination and minimise disturbance; and
- Blackout blinds and/or curtains will be used where possible when working in marine SPAs.

6 CONCLUSION

This risk assessment has assessed the risk posed by the geophysical survey (including equipment calibration) activities associated with the 17 cable routes within the West Highlands marine region to EPS and protected sites. This has included assessing the risk caused by noise emitted from the vessel and the geophysical survey, collision impact and disturbance to the following protected species and sites:

- Cetaceans;
- Seals;
- Otters;
- Basking sharks;
- Birds;
- SACs;
- NCMPAs; and
- SPAs.

The West Highlands cable routes are all located within 50 km of the Inner Hebrides and the Minches cSAC and the Sea of Hebrides pMPA, however due to the temporal aspect of each geophysical survey no adverse impact through injury to cetaceans is anticipated, however the use of geophysical survey equipment may cause disturbance to the marine mammals in the vicinity and as such, an application for an EPS Licence will be submitted.

The cable route survey area is within 50 km of the Sea of Hebrides pMPA, however due to the short, temporal aspect of each geophysical survey, the potential impact to basking sharks is considered very low and will be reduced further through implementation of the mitigation measures. However, disturbance to basking sharks remains a possibility, and as such, an application for a Basking Shark Licence will be submitted.

Due to the low density of harbour and grey seals within most of the proposed survey areas, and the short-term and localised nature of each individual cable route activity, long-term impacts to harbour and grey seal populations will not be significant. A number of mitigation strategies will also be followed to further reduce any potential impact on seals if any are encountered during the proposed survey operations.

Breeding and moulting seabirds species may be impacted by the physical presence of vessels within the survey areas, however, given the temporary and short-term nature of the proposed activities (up to 16 days in total for the main West Highlands survey campaign and an additional 35.5 days for the two longer cables routes (Skye - South Uist and Skye - Harris), the potential impacts on seabirds are not considered to be significant. The survey corridors are within the vicinity of two SPAs; Cullins SPA and Moidart and Ardgour SPA. Due to the temporary and localised nature of the surveys, no significant or adverse impact is anticipated on any of the sites. Further to this, a number of mitigation strategies will also be followed to further reduce any potential impact on seabirds.

The survey corridor overlaps with the Lochs Duich, Long and Alsh Reefs SAC. As relatively small benthic samples will be extracted during the project activities, of less than 1 metre^3, a Marine Licence Exemption application will be submitted.

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

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APPENDIX A TABLE OF CABLE ROUTES COORDINATES

Cable	Co-ordinates for the survey works, (WGS84) (the DMS are not negative due to these being westerlies i.e. west of Greenwich meantime)		Co-ordinates for the survey works, (WGS84) (the DDM are not negative due to these being westerlines i.e. west of Greenwich meantime)		Co-ordinates for EPS licence application form and JNCC noise registry	
	Latitude DMS N	Longitude DMS W	Latitude DD N	Longitude DD W	Latitude DD	Longitude DD
Corran Narrows Centre	56° 43' 42.25" N	5° 14' 14.35" W	56° 43.704' N	5° 14.239' W	56.728404	-5.237320
	56° 43' 37.82" N	5° 13' 53.25" W	56° 43.630' N	5° 13.888' W	56.727173	-5.231459
	56° 43' 13.10" N	5° 14' 11.32" W	56° 43.218' N	5° 14.189' W	56.720305	-5.236478
	56° 43' 7.12" N	5° 14' 21.37" W	56° 43.119' N	5° 14.356' W	56.718644	-5.239269
	56° 43' 8.00" N	5° 14' 43.37" W	56° 43.133' N	5° 14.723' W	56.718890	-5.245382
	56° 43' 10.12" N	5° 14' 56.84" W	56° 43.169' N	5° 14.947' W	56.719476	-5.249122
	56° 43' 12.01" N	5° 14' 36.46" W	56° 43.200' N	5° 14.608' W	56.720002	-5.243460
	56° 43' 17.46" N	5° 14' 31.49" W	56° 43.291' N	5° 14.525' W	56.721516	-5.242080
	56° 43' 21.68" N	5° 14' 34.92" W	56° 43.361' N	5° 14.582' W	56.722689	-5.243034
	56° 43' 34.63" N	5° 15' 4.69" W	56° 43.577' N	5° 15.078' W	56.726286	-5.251302
	56° 43' 41.20" N	5° 14' 46.36" W	56° 43.687' N	5° 14.773' W	56.728110	-5.246210
	56° 43' 42.25" N	5° 14' 14.35" W	56° 43.704' N	5° 14.239' W	56.728404	-5.237320
Corran Narrows North	56° 43' 48.76" N	5° 13' 39.83" W	56° 43.813' N	5° 13.664' W	56.730212	-5.227732
	56° 43' 37.29" N	5° 13' 53.92" W	56° 43.622' N	5° 13.899' W	56.727025	-5.231644
	56° 43' 17.88" N	5° 14' 5.77" W	56° 43.298' N	5° 14.096' W	56.721632	-5.234935
	56° 43' 15.46" N	5° 14' 31.26" W	56° 43.258' N	5° 14.521' W	56.720960	-5.242016
	56° 43' 21.68" N	5° 14' 34.92" W	56° 43.361' N	5° 14.582' W	56.722689	-5.243034
	56° 43' 37.32" N	5° 15' 10.12" W	56° 43.622' N	5° 15.169' W	56.727034	-5.252812
	56° 43' 45.97" N	5° 15' 19.44" W	56° 43.766' N	5° 15.324' W	56.729437	-5.255400
	56° 43' 49.67" N	5° 15' 0.87" W	56° 43.828' N	5° 15.015' W	56.730463	-5.250241
	56° 43' 47.64" N	5° 14' 42.18" W	56° 43.794' N	5° 14.703' W	56.729901	-5.245049
	56° 43' 51.04" N	5° 13' 54.38" W	56° 43.851' N	5° 13.906' W	56.730845	-5.231773
	56° 43' 48.76" N	5° 13' 39.83" W	56° 43.813' N	5° 13.664' W	56.730212	-5.227732
Corran Narrows South	56° 43' 42.24" N	5° 14' 37.06" W	56° 43.704' N	5° 14.618' W	56.728400	-5.243628
	56° 43' 35.34" N	5° 13' 54.51" W	56° 43.589' N	5° 13.909' W	56.726482	-5.231810
	56° 43' 17.74" N	5° 14' 5.57" W	56° 43.296' N	5° 14.093' W	56.721594	-5.234881
	56° 43' 5.46" N	5° 14' 22.53" W	56° 43.091' N	5° 14.376' W	56.718185	-5.239592
	56° 43' 10.12" N	5° 14' 56.80" W	56° 43.169' N	5° 14.947' W	56.719477	-5.249112
	56° 43' 12.01" N	5° 14' 36.46" W	56° 43.200' N	5° 14.608' W	56.720002	-5.243460
	56° 43' 17.46" N	5° 14' 31.49" W	56° 43.291' N	5° 14.525' W	56.721516	-5.242080
	56° 43' 21.68" N	5° 14' 34.92" W	56° 43.361' N	5° 14.582' W	56.722689	-5.243034
	56° 43' 34.65" N	5° 15' 4.74" W	56° 43.578' N	5° 15.079' W	56.726292	-5.251316
	56° 43' 40.29" N	5° 14' 53.04" W	56° 43.672' N	5° 14.884' W	56.727857	-5.248067
	56° 43' 42.24" N	5° 14' 37.06" W	56° 43.704' N	5° 14.618' W	56.728400	-5.243628
Kyle - Skye North (1)	57° 16' 28.31" N	5° 41' 38.89" W	57° 16.472' N	5° 41.648' W	57.274531	-5.694135
	57° 16' 10.81" N	5° 42' 0.70" W	57° 16.180' N	5° 42.012' W	57.269670	-5.700194
	57° 15' 56.59" N	5° 42' 28.09" W	57° 15.943' N	5° 42.468' W	57.265719	-5.707803
	57° 15' 55.79" N	5° 42' 44.52" W	57° 15.930' N	5° 42.742' W	57.265497	-5.712367
	57° 16' 1.28" N	5° 43' 1.75" W	57° 16.021' N	5° 43.029' W	57.267023	-5.717153
	57° 16' 21.10" N	5° 43' 3.16" W	57° 16.352' N	5° 43.053' W	57.272528	-5.717544
	57° 16' 38.42" N	5° 42' 36.72" W	57° 16.640' N	5° 42.612' W	57.277338	-5.710200
	57° 16' 46.44" N	5° 42' 36.58" W	57° 16.774' N	5° 42.610' W	57.279567	-5.710162
	57° 16' 50.98" N	5° 42' 27.99" W	57° 16.850' N	5° 42.467' W	57.280828	-5.707776
	57° 16' 54.22" N	5° 41' 38.26" W	57° 16.904' N	5° 41.638' W	57.281727	-5.693962
	57° 16' 28.31" N	5° 41' 38.89" W	57° 16.472' N	5° 41.648' W	57.274531	-5.694135
Kyle - Skye South (2)	57° 16' 51.75" N	5° 41' 29.87" W	57° 16.863' N	5° 41.498' W	57.281042	-5.691631
	57° 16' 26.90" N	5° 41' 32.23" W	57° 16.448' N	5° 41.537' W	57.274138	-5.692286
	57° 16' 4.28" N	5° 41' 51.74" W	57° 16.071' N	5° 41.862' W	57.267855	-5.697705
	57° 15' 51.72" N	5° 42' 27.76" W	57° 15.862' N	5° 42.463' W	57.264366	-5.707711
	57° 15' 52.28" N	5° 42' 54.87" W	57° 15.871' N	5° 42.915' W	57.264522	-5.715243
	57° 15' 59.41" N	5° 43' 6.81" W	57° 15.990' N	5° 43.114' W	57.266504	-5.718557
	57° 16' 21.87" N	5° 43' 5.59" W	57° 16.365' N	5° 43.093' W	57.272741	-5.718219
	57° 16' 25.88" N	5° 42' 52.71" W	57° 16.431' N	5° 42.879' W	57.273855	-5.714642
	57° 16' 35.50" N	5° 42' 30.19" W	57° 16.592' N	5° 42.503' W	57.276526	-5.708386
	57° 16' 50.82" N	5° 42' 28.48" W	57° 16.847' N	5° 42.475' W	57.280784	-5.707910
	57° 16' 56.86" N	5° 41' 35.03" W	57° 16.948' N	5° 41.584' W	57.282460	-5.693063
	57° 16' 51.75" N	5° 41' 29.87" W	57° 16.863' N	5° 41.498' W	57.281042	-5.691631

Loch a'Choire North	56° 37' 1.57" N	5° 28' 6.19" W	56° 37.026' N	5° 28.103' W	56.617102	-5.468385
	56° 36' 52.04" N	5° 28' 5.22" W	56° 36.867' N	5° 28.087' W	56.614455	-5.468118
	56° 36' 34.40" N	5° 28' 17.55" W	56° 36.573' N	5° 28.293' W	56.609555	-5.471542
	56° 36' 10.59" N	5° 28' 50.44" W	56° 36.177' N	5° 28.841' W	56.602943	-5.480677
	56° 36' 1.79" N	5° 29' 9.85" W	56° 36.030' N	5° 29.164' W	56.600498	-5.486069
	56° 35' 55.85" N	5° 29' 41.48" W	56° 35.931' N	5° 29.691' W	56.598846	-5.494855
	56° 35' 57.39" N	5° 29' 59.13" W	56° 35.957' N	5° 29.986' W	56.599275	-5.499759
	56° 36' 27.41" N	5° 29' 53.74" W	56° 36.457' N	5° 29.896' W	56.607613	-5.498262
	56° 36' 32.45" N	5° 29' 33.88" W	56° 36.541' N	5° 29.565' W	56.609014	-5.492745
	56° 36' 46.28" N	5° 29' 12.96" W	56° 36.771' N	5° 29.216' W	56.612854	-5.486933
	56° 37' 1.75" N	5° 29' 3.04" W	56° 37.029' N	5° 29.051' W	56.617153	-5.484177
	56° 37' 1.57" N	5° 28' 6.19" W	56° 37.026' N	5° 28.103' W	56.617102	-5.468385
Loch a'Choire South	56° 36' 54.94" N	5° 28' 2.60" W	56° 36.916' N	5° 28.043' W	56.615262	-5.467390
	56° 36' 27.00" N	5° 28' 18.90" W	56° 36.450' N	5° 28.315' W	56.607500	-5.471917
	56° 36' 7.66" N	5° 28' 52.72" W	56° 36.128' N	5° 28.879' W	56.602129	-5.481312
	56° 35' 58.12" N	5° 29' 21.99" W	56° 35.969' N	5° 29.367' W	56.599477	-5.489442
	56° 35' 55.41" N	5° 29' 43.38" W	56° 35.924' N	5° 29.723' W	56.598724	-5.495384
	56° 35' 57.46" N	5° 29' 59.08" W	56° 35.958' N	5° 29.985' W	56.599294	-5.499745
	56° 36' 28.01" N	5° 29' 46.44" W	56° 36.467' N	5° 29.774' W	56.607781	-5.496234
	56° 36' 30.71" N	5° 29' 34.25" W	56° 36.512' N	5° 29.571' W	56.608529	-5.492847
	56° 36' 42.19" N	5° 29' 11.99" W	56° 36.703' N	5° 29.200' W	56.611721	-5.486664
	56° 37' 0.57" N	5° 29' 2.48" W	56° 37.010' N	5° 29.041' W	56.616825	-5.484021
	56° 37' 2.45" N	5° 28' 5.29" W	56° 37.041' N	5° 28.088' W	56.617347	-5.468137
	56° 36' 54.94" N	5° 28' 2.60" W	56° 36.916' N	5° 28.043' W	56.615262	-5.467390
Loch Eil Narrows	56° 50' 41.54" N	5° 9' 49.82" W	56° 50.692' N	5° 9.830' W	56.844873	-5.163840
	56° 50' 30.76" N	5° 9' 25.89" W	56° 50.513' N	5° 9.432' W	56.841879	-5.157190
	56° 50' 25.09" N	5° 9' 42.31" W	56° 50.418' N	5° 9.705' W	56.840304	-5.161753
	56° 50' 32.33" N	5° 9' 49.97" W	56° 50.539' N	5° 9.833' W	56.842313	-5.163880
	56° 50' 34.58" N	5° 10' 4.28" W	56° 50.576' N	5° 10.071' W	56.842938	-5.167856
	56° 50' 40.37" N	5° 10' 17.37" W	56° 50.673' N	5° 10.290' W	56.844547	-5.171492
	56° 50' 41.91" N	5° 10' 34.15" W	56° 50.699' N	5° 10.569' W	56.844975	-5.176151
	56° 50' 49.89" N	5° 10' 23.30" W	56° 50.832' N	5° 10.388' W	56.847192	-5.173138
	56° 50' 56.74" N	5° 9' 58.03" W	56° 50.946' N	5° 9.967' W	56.849095	-5.166120
	56° 50' 48.18" N	5° 9' 45.34" W	56° 50.803' N	5° 9.756' W	56.846716	-5.162595
	56° 50' 41.54" N	5° 9' 49.82" W	56° 50.692' N	5° 9.830' W	56.844873	-5.163840
Loch Sligachan, Skye East	57° 19' 7.99" N	6° 5' 49.42" W	57° 19.133' N	6° 5.824' W	57.318887	-6.097060
	57° 18' 47.97" N	6° 5' 49.75" W	57° 18.800' N	6° 5.829' W	57.313324	-6.097152
	57° 18' 53.61" N	6° 6' 17.63" W	57° 18.894' N	6° 6.294' W	57.314891	-6.104896
	57° 18' 47.80" N	6° 6' 45.57" W	57° 18.797' N	6° 6.760' W	57.313278	-6.112658
	57° 19' 10.95" N	6° 6' 47.73" W	57° 19.183' N	6° 6.796' W	57.319709	-6.113260
	57° 19' 13.30" N	6° 6' 30.45" W	57° 19.222' N	6° 6.508' W	57.320361	-6.108457
	57° 19' 7.22" N	6° 6' 19.02" W	57° 19.120' N	6° 6.317' W	57.318671	-6.105284
	57° 19' 18.78" N	6° 6' 1.24" W	57° 19.313' N	6° 6.021' W	57.321882	-6.100343
	57° 19' 7.99" N	6° 5' 49.42" W	57° 19.133' N	6° 5.824' W	57.318887	-6.097060
Loch Sligachan, Skye Wes	57° 19' 8.55" N	6° 5' 49.39" W	57° 19.143' N	6° 5.823' W	57.319042	-6.097052
	57° 18' 47.92" N	6° 5' 51.00" W	57° 18.799' N	6° 5.850' W	57.313312	-6.097499
	57° 18' 53.61" N	6° 6' 17.63" W	57° 18.894' N	6° 6.294' W	57.314891	-6.104896
	57° 18' 47.49" N	6° 6' 46.88" W	57° 18.792' N	6° 6.781' W	57.313190	-6.113023
	57° 19' 10.95" N	6° 6' 47.73" W	57° 19.183' N	6° 6.796' W	57.319709	-6.113260
	57° 19' 13.30" N	6° 6' 30.45" W	57° 19.222' N	6° 6.508' W	57.320361	-6.108457
	57° 19' 7.22" N	6° 6' 19.02" W	57° 19.120' N	6° 6.317' W	57.318671	-6.105284
	57° 19' 19.31" N	6° 6' 0.74" W	57° 19.322' N	6° 6.012' W	57.322030	-6.100207
	57° 19' 8.55" N	6° 5' 49.39" W	57° 19.143' N	6° 5.823' W	57.319042	-6.097052
Lochaline - Mull	56° 32' 0.55" N	5° 47' 51.36" W	56° 32.009' N	5° 47.856' W	56.533487	-5.797600
	56° 32' 1.76" N	5° 47' 31.97" W	56° 32.029' N	5° 47.533' W	56.533823	-5.792213
	56° 31' 56.92" N	5° 47' 2.12" W	56° 31.949' N	5° 47.035' W	56.532477	-5.783923
	56° 30' 49.78" N	5° 47' 1.74" W	56° 30.830' N	5° 47.029' W	56.513827	-5.783818
	56° 30' 39.53" N	5° 47' 9.71" W	56° 30.659' N	5° 47.162' W	56.510980	-5.786029
	56° 30' 34.25" N	5° 47' 26.73" W	56° 30.571' N	5° 47.446' W	56.509515	-5.790757
	56° 30' 42.53" N	5° 47' 37.83" W	56° 30.709' N	5° 47.631' W	56.511814	-5.793842
	56° 30' 51.62" N	5° 47' 40.50" W	56° 30.860' N	5° 47.675' W	56.514340	-5.794584
	56° 30' 56.64" N	5° 47' 59.97" W	56° 30.944' N	5° 48.000' W	56.515734	-5.799993
	56° 31' 53.54" N	5° 48' 1.85" W	56° 31.892' N	5° 48.031' W	56.531540	-5.800515
	56° 32' 3.49" N	5° 47' 55.81" W	56° 32.058' N	5° 47.930' W	56.534303	-5.798836
	56° 32' 0.55" N	5° 47' 51.36" W	56° 32.009' N	5° 47.856' W	56.533487	-5.797600

Lochaline (Ardtornish)	56° 32' 18.21" N	5° 45' 49.43" W	56° 32.304' N	5° 45.824' W	56.538393	-5.763730
	56° 32' 13.62" N	5° 45' 53.53" W	56° 32.227' N	5° 45.892' W	56.537117	-5.764870
	56° 32' 16.55" N	5° 46' 15.85" W	56° 32.276' N	5° 46.264' W	56.537930	-5.771068
	56° 32' 9.28" N	5° 46' 21.36" W	56° 32.155' N	5° 46.356' W	56.535911	-5.772600
	56° 31' 57.58" N	5° 46' 17.29" W	56° 31.960' N	5° 46.288' W	56.532660	-5.771470
	56° 32' 1.16" N	5° 46' 38.12" W	56° 32.019' N	5° 46.635' W	56.533655	-5.777255
	56° 32' 5.08" N	5° 46' 31.65" W	56° 32.085' N	5° 46.528' W	56.534745	-5.775459
	56° 32' 15.21" N	5° 46' 33.63" W	56° 32.254' N	5° 46.561' W	56.537560	-5.776009
	56° 32' 32.82" N	5° 46' 24.67" W	56° 32.547' N	5° 46.411' W	56.542451	-5.773520
	56° 32' 26.61" N	5° 45' 59.83" W	56° 32.444' N	5° 45.997' W	56.540725	-5.766621
	56° 32' 18.21" N	5° 45' 49.43" W	56° 32.304' N	5° 45.824' W	56.538393	-5.763730
Lochalsh (Gleneig)	57° 16' 29.10" N	5° 34' 12.83" W	57° 16.485' N	5° 34.214' W	57.274749	-5.570230
	57° 15' 25.22" N	5° 34' 41.56" W	57° 15.420' N	5° 34.693' W	57.257006	-5.578211
	57° 15' 19.35" N	5° 35' 2.58" W	57° 15.323' N	5° 35.043' W	57.255375	-5.584049
	57° 15' 19.02" N	5° 35' 30.03" W	57° 15.317' N	5° 35.501' W	57.255284	-5.591675
	57° 15' 32.66" N	5° 35' 39.62" W	57° 15.544' N	5° 35.660' W	57.259073	-5.594339
	57° 16' 23.30" N	5° 35' 16.24" W	57° 16.388' N	5° 35.271' W	57.273140	-5.587844
	57° 16' 30.56" N	5° 34' 48.77" W	57° 16.509' N	5° 34.813' W	57.275156	-5.580214
	57° 16' 29.10" N	5° 34' 12.83" W	57° 16.485' N	5° 34.214' W	57.274749	-5.570230
Skye - Harris	57° 47' 25.03" N	6° 49' 12.14" W	57° 47.417' N	6° 49.202' W	57.790285	-6.820040
	57° 45' 8.59" N	6° 49' 20.01" W	57° 45.143' N	6° 49.334' W	57.752386	-6.822225
	57° 40' 30.67" N	6° 47' 46.81" W	57° 40.511' N	6° 47.780' W	57.675187	-6.796336
	57° 34' 8.98" N	6° 39' 6.21" W	57° 34.150' N	6° 39.104' W	57.569162	-6.651725
	57° 33' 26.93" N	6° 38' 37.80" W	57° 33.449' N	6° 38.630' W	57.557480	-6.643834
	57° 32' 59.51" N	6° 39' 12.73" W	57° 32.992' N	6° 39.212' W	57.549864	-6.653537
	57° 40' 17.98" N	6° 48' 43.06" W	57° 40.300' N	6° 48.718' W	57.671662	-6.811960
	57° 45' 7.45" N	6° 50' 20.93" W	57° 45.124' N	6° 50.349' W	57.752069	-6.839148
	57° 47' 4.61" N	6° 50' 12.46" W	57° 47.077' N	6° 50.208' W	57.784614	-6.836794
	57° 47' 51.61" N	6° 51' 39.96" W	57° 47.860' N	6° 51.666' W	57.797671	-6.861101
	57° 48' 40.14" N	6° 51' 49.18" W	57° 48.669' N	6° 51.820' W	57.811150	-6.863660
	57° 47' 25.03" N	6° 49' 12.14" W	57° 47.417' N	6° 49.202' W	57.790285	-6.820040
Skye - Scalpay	57° 16' 34.06" N	5° 59' 6.40" W	57° 16.568' N	5° 59.107' W	57.276127	-5.985112
	57° 16' 25.95" N	5° 58' 49.32" W	57° 16.433' N	5° 58.822' W	57.273876	-5.980367
	57° 16' 29.37" N	5° 58' 40.28" W	57° 16.490' N	5° 58.671' W	57.274824	-5.977856
	57° 16' 30.17" N	5° 58' 22.72" W	57° 16.503' N	5° 58.379' W	57.275047	-5.972979
	57° 16' 20.11" N	5° 58' 24.19" W	57° 16.335' N	5° 58.403' W	57.272253	-5.973387
	57° 16' 2.46" N	5° 58' 44.01" W	57° 16.041' N	5° 58.734' W	57.267351	-5.978893
	57° 16' 4.58" N	5° 58' 58.45" W	57° 16.076' N	5° 58.974' W	57.267940	-5.982904
	57° 16' 13.56" N	5° 59' 34.31" W	57° 16.226' N	5° 59.572' W	57.270433	-5.992864
	57° 16' 32.69" N	5° 59' 21.89" W	57° 16.545' N	5° 59.365' W	57.275747	-5.989413
	57° 16' 38.74" N	5° 59' 10.88" W	57° 16.646' N	5° 59.181' W	57.277427	-5.986356
	57° 16' 34.06" N	5° 59' 6.40" W	57° 16.568' N	5° 59.107' W	57.276127	-5.985112
Skye - South Uist	57° 33' 13.41" N	6° 38' 23.79" W	57° 33.224' N	6° 38.397' W	57.553724	-6.639942
	57° 29' 37.67" N	6° 50' 34.15" W	57° 29.628' N	6° 50.569' W	57.493798	-6.842820
	57° 25' 3.61" N	6° 55' 45.37" W	57° 25.060' N	6° 55.756' W	57.417669	-6.929271
	57° 21' 37.63" N	7° 5' 54.84" W	57° 21.627' N	7° 5.914' W	57.360454	-7.098567
	57° 21' 27.51" N	7° 15' 27.58" W	57° 21.459' N	7° 15.460' W	57.357643	-7.257661
	57° 22' 2.15" N	7° 16' 20.68" W	57° 22.036' N	7° 16.345' W	57.367263	-7.272411
	57° 22' 8.24" N	7° 12' 37.08" W	57° 22.137' N	7° 12.618' W	57.368954	-7.210301
	57° 22' 7.37" N	7° 6' 20.19" W	57° 22.123' N	7° 6.337' W	57.368714	-7.105607
	57° 25' 29.25" N	6° 56' 21.98" W	57° 25.488' N	6° 56.366' W	57.424791	-6.939440
	57° 30' 2.27" N	6° 51' 13.76" W	57° 30.038' N	6° 51.229' W	57.500631	-6.853823
	57° 34' 15.10" N	6° 39' 45.86" W	57° 34.252' N	6° 39.764' W	57.570862	-6.662738
	57° 33' 13.41" N	6° 38' 23.79" W	57° 33.224' N	6° 38.397' W	57.553724	-6.639942
Skye Raasay	57° 20' 24.00" N	6° 4' 12.64" W	57° 20.400' N	6° 4.211' W	57.339999	-6.070178
	57° 19' 54.67" N	6° 3' 47.02" W	57° 19.911' N	6° 3.784' W	57.331852	-6.063061
	57° 19' 50.19" N	6° 4' 24.43" W	57° 19.837' N	6° 4.407' W	57.330609	-6.073454
	57° 19' 52.99" N	6° 5' 33.36" W	57° 19.883' N	6° 5.556' W	57.331386	-6.092599
	57° 19' 50.91" N	6° 5' 54.71" W	57° 19.849' N	6° 5.912' W	57.330809	-6.098530
	57° 19' 53.01" N	6° 6' 10.33" W	57° 19.884' N	6° 6.172' W	57.331393	-6.102870
	57° 19' 58.23" N	6° 6' 22.40" W	57° 19.971' N	6° 6.373' W	57.332841	-6.106222
	57° 20' 5.15" N	6° 6' 25.50" W	57° 20.086' N	6° 6.425' W	57.334764	-6.107085
	57° 20' 9.54" N	6° 6' 23.10" W	57° 20.159' N	6° 6.385' W	57.335982	-6.106416
	57° 20' 19.16" N	6° 6' 2.54" W	57° 20.319' N	6° 6.042' W	57.338656	-6.100706
	57° 20' 25.10" N	6° 5' 45.24" W	57° 20.418' N	6° 5.754' W	57.340306	-6.095900
	57° 20' 24.00" N	6° 4' 12.64" W	57° 20.400' N	6° 4.211' W	57.339999	-6.070178