XOCEAN

Ocean data, delivered.

Environmental Impact Statement

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Shetland Multiclient

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1 Introduction

XOCEAN has developed Uncrewed Surface Vessels (USV) to provide an efficient and cost-effective solution to collect ocean data.

The environmental impact statement provides information for XOCEAN, its authorities and contractors during project activities.

1.1 Purpose Of Document

The project environmental impact statement serves a critical purpose in the planning and execution. This document's goal is to assess the potential environmental effects of a proposed activities and identify measures to mitigate any adverse impacts. This process ensures that the project is designed and implemented sustainably and responsibly, considering the social, economic, and environmental factors. The assessment is vital in promoting sustainable development and protecting the environment for future generations.

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

1. An assessment of potential impacts on cetaceans, and determination of the need for a European Protected Species (EPS) Licence under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended in Scotland) (the Habitats Regulations). Where an EPS licence is required, this document also provides the marine mammal risk assessment to support the application.
2. An assessment of potential impact on basking sharks, and determination of whether a derogation licence will be required under the Wildlife and Countryside Act 1981 (as amended) (from hereon, 'the WCA').
3. An assessment of the potential for likely significant effects on designated sites and designated seal haul outs, as required by Marine (Scotland) Act 2010 (as amended) and Protection of Seals (Designated Sea Haul out Sites) (Scotland) Order 2014; and
4. Notice of intention to carry out a Marine Licence exempted activity for the sediment sampling component of benthic surveys, which may be undertaken. º

1.2 Reference Documents

The following documents contain information pertinent to this project manual:

Reference	Document Number
XOCEAN QMS Documentation	
XOCEAN Environmental Impact and Waste Management Process	L2-XO-PROC-13
Health, Safety, Environment and Sustainability Policy	L1-XO-POL-15
Marine Mammal Impact Mitigation	L2-OPS-PROC-38
HSE Incident Reporting and Investigation Standard	L2-XO-STND-154

2 Project Introduction

2.1 Project Description

XOCEAN is looking to conduct exploratory geophysical surveys covering pipeline routes from Sullom Voe and the near shore extents of the Offshore wind farm export cable routes. XOCEAN are proposing to collect MBES and SBP data along the route around the Shetland Islands.

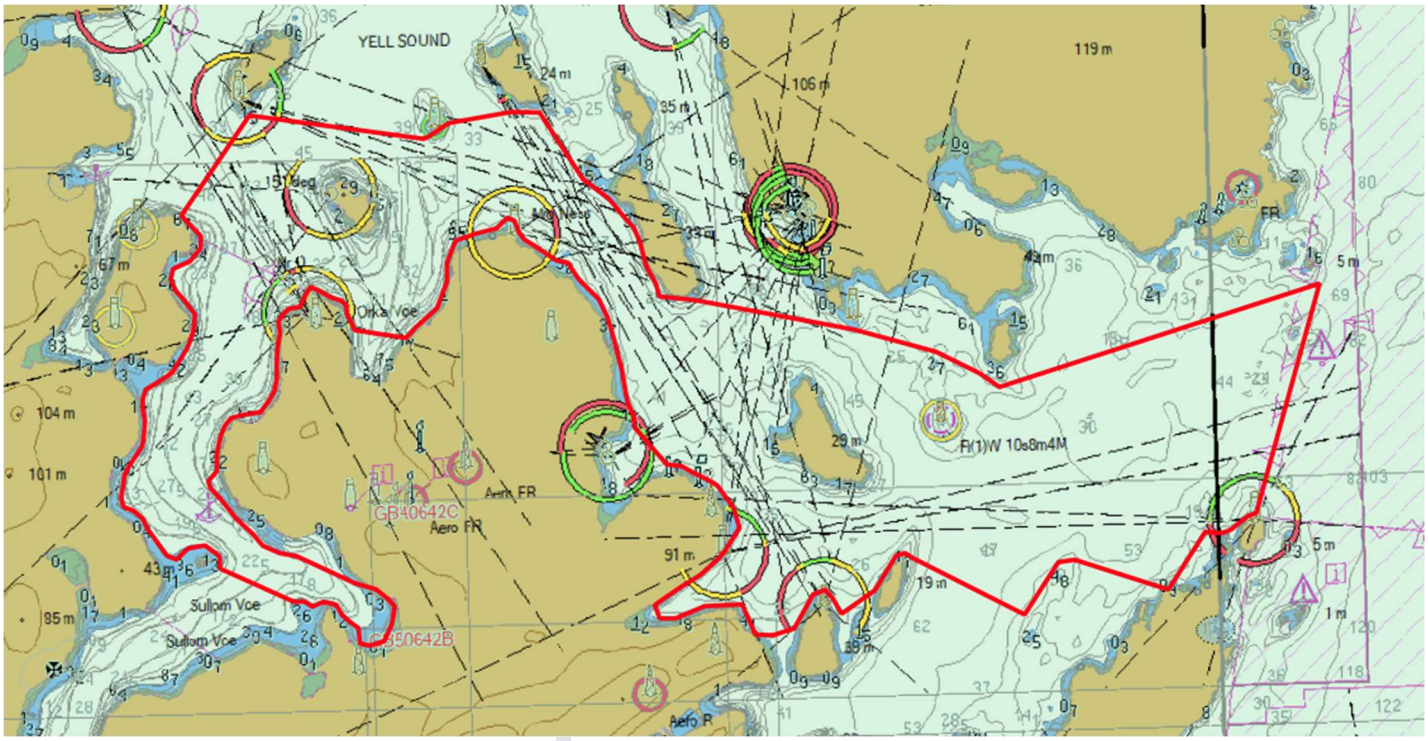

Figure 1. Proposed Acquisition Boundary

2.2 Project Details

- **Dates/Duration:** The MBES survey is envisaged to take approximately 20 days to complete, including mobilisation and demobilisation activities for 2 USV's.
- **Location:**
  - Landfall location – Sullom Voe
  - Offshore location – Sullom Voe, Dales Voe & North Sea
- **Scope:**
  - MBES, SBP and backscatter for all virgin areas.
  - Up to the 10m contour in all areas apart from A01 and B04

Table 1 - Survey Area Co-ordinates for the extent of the survey area

Extents of the survey Area	Easting	Northing	Latitude	Longitude

1	6705844.523	603864.3631	60°28′31.337″N	1°06′37.947″W
2	6707099.739	608615.9751	60°29′07.378″N	1°01′24.510″W
3	6709487.462	597711.3002	60°30′34.568″N	1°13′14.228″W
4	6707016.308	599380.7457	60°29′13.262″N	1°11′29.296″W
5	6709446.714	593652.7237	60°30′36.723″N	1°17′40.229″W
6	6702103.787	595539.3913	60°26′37.891″N	1°15′49.299″W
7	6703978.23	591892.3773	60°27′41.501″N	1°19′44.674″W
8	6702185.285	600971.2011	60°26′35.765″N	1°09′53.980″W
9	6702686.494	595600.5145	60°26′56.666″N	1°15′44.296″W
10	6703896.733	607731.4204	60°27′24.762″N	1°02′28.658″W
11	6702823.649	606501.8236	60°26′51.272″N	1°03′51.148″W
12	6705844.523	603864.3631	60°28′31.337″N	1°06′37.947″W
13	6707099.739	608615.9751	60°29′07.378″N	1°01′24.510″W
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3 Protected Species Overview

3.1 Marine protected species

3.1.1 Shetland Isles

The Shetland Isles has 25 protected species that inhabit their territorial waters in a range of abundance. This include sixteen species of cetaceans (whales, dolphins & porpoises), seven seal species, Eurasian otters and basking sharks. As well as vagrant species that have been seen on occasions such as walrus, beluga.

Table 2 Species summary in Shetland isles including distribution and abundance.

Species	Scientific name	Distribution	Abundance *
Harbour porpoise	*Phocoena phocoena*	UK wide highest sightings rates in the south-eastern North Sea < 100 m	Year-round ~ 24,370
Bottlenose dolphin	*Tursiops truncatus*	UK wide, highest proportion north-east Scotland (especially the Moray Firth),	Year-round Observed most frequently between June and October ~500 individuals
Common dolphin	*Delphinus delphis*	UK wide, highest proportion Celtic and Greater North Seas Seasonally in north sea	Year-round ~ 56,556
White sided Dolphin	*Lagenorhynchus acutus*	Celtic and Greater North Seas depths of 100-500 m	Year-round ~69,293
Risso's dolphin	*Grampus griseus*	West coast & Northern Isles of Scotland, 50-100 m depths	Seasonal May and September. Unknown abundance
Minke whale	*Balaenoptera acutorostrata*	Celtic and Greater North Seas Depths of 200 m or less	West of Scotland Year-round East of Scotland Seasonal (May-September) Estimated 39,572 individuals. (overall W1000, E200)
Humpback whale	*Megaptera novaeangliae*	North Atlantic Waters deeper than 200 m	Seasonal (May-September) ~3500 individuals
Sei Whale	*Balaenoptera borealis*	Northern Isles and the Faroes, Scotland, waters deeper than 200 m (mainly 500-3,000 m depth)	Seasonal (May - October, *Pollock et al. 2000*) <2 individuals
Fin Whale	*Balaenoptera physalus*	Northern Isles and the Faroes, Scotland, Beyond the 500 m depth contour	Seasonal (June - November *Evans 1992; Pollock et al. 1997, 2000)* ~50,000 individuals (overall W30, E5)

Sperm Whale	*Physeter macrocephalus*	West coast & Northern Isles of Scotland, Deeper than 200 m depth	Seasonal (July- December) 30,000 individuals
Northern Bottlenose Whale	*Hyperoodon ampullatus*	Around the Faroe Islands 100-1,000 m depths	Seasonal (July – October) ~15 individuals
Killer whale (orca)	*Orcinus orca*	Northern and western Scotland,	Year-round Shetland (May- June) 778,000
Striped dolphin	*Stenella coeruleoalba*	Rare Southern UK, occasional northwest	July -December <2 UK wide
White- Beaked Dolphin	*Lagenorhynchus albirostris*	UK wide, predominantly Celtic and Greater North Seas	Year-round Observed most frequently between June and October ~15,895
Long-finned Pilot Whale	*Globicephala melas*	North of Scotland and south-east of the Faroes Deep waters (200-3,000 m)	Year –round ~560,000
Beluga	*Delphinapterus leucas*	North-west Scotland, around the Northern Isles and in the North Sea	Vagrant

Species	Scientific name	Distribution	Abundance *
Grey Seal	*Halichoerus grypus*	UK wide, Highest sightings west Scotland	4582 (4211 – 5193)
Harbour (common) Seal	*Phoca vitulina*	UK wide, Highest sightings west Scotland	4679 (3828 – 6239)

* The abundance is based off estimated maximum baselines detailed in Hague, E.L., Sinclair, R.R. and Sparling, C.E., 2020, and SOCS ,2022,

3.2 Marine Species Legislation

3.2.1 Scotland

3.2.1.1 Cetaceans

Cetaceans (whales, dolphins, porpoise) are designated as European Protected Species in Scotland under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended) within Scottish Territorial Waters (within the 12 NM limit). Further to this, cetaceans are offered additional protection on an individual level, with the specific inclusion of Regulation 39(2) which states that “it is an offence to deliberately or recklessly disturb any dolphin, porpoise or whale (cetacean)”.

In offshore waters (greater than 12 nautical miles from land) cetaceans are protected by other laws including the Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2017 (as amended). It is an offence:

- to deliberately or recklessly capture, kill, injure, harass or disturb any whale, dolphin or porpoise.
- to damage or destroy a breeding site or resting place of any whale, dolphin or porpoise.
- to possess, sell or offer for sale any part of a cetacean (for example, taken from a dead cetacean on a beach).

– to knowingly cause or permit any of the above offences.

Bottlenose dolphin and harbour porpoise are both listed on Annex II of the Habitats Directive 1992 as species of Community interest whose conservation requires the designation of Special Areas of Conservation (SACs). All whales, dolphins and porpoises are listed on Annex IV of the Directive as species of Community interest in need of strict protection.

3.2.1.2 Seals

Under Part 6 of the Marine (Scotland) Act 2010 (as amended) – Conservation of Seals, it is an offence to intentionally or recklessly kill or take a live seal without a licence. It is also an offence to intentionally or recklessly injure a live seal. The Act allows for exceptions for animal welfare reasons only. Both species of seal are listed on Annex II and Annex V of the EC Habitats Directive 1992. Species listed on Annex II are those considered to be of Community interest whose conservation requires the designation of Special Areas of Conservation (SACs). A number of SACs have been designated for harbour and grey seals around Scotland to protect particularly important sites. Species listed on Annex V are those which may not be taken or killed in certain ways outlined in the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended).

3.2.1.3 Other Species

Basking Sharks

Basking sharks are protected under the Wildlife and Countryside Act 1981 (as amended).

It is an offence:

– to intentionally or recklessly capture, kill, injure, take, harass or disturb any basking shark.

– to intentionally or recklessly damage, destroy or obstruct access to any structure or place a basking shark uses for shelter or protection.

– to possess, sell or offer for sale any part of a basking shark (for example, taken from a dead basking shark on a beach).

– to knowingly cause or permit any of the above offences.

Sea Turtles

Turtles are listed on Annex IV of the EC Habitats Directive 1992 as species of Community interest in need of strict protection. In Scotland, turtles are protected by the Conservation (Natural Habitats &c) Regulations 1994 (as amended) and are known as European protected species.

Otters

Otters are listed on Annex II of the EC Habitats Directive 1992 as a species of Community interest whose conservation requires the designation of Special Areas of Conservation (SACs). Otters are also listed on Annex IV as a species of Community interest in need of strict protection. In Scotland, otters are protected by the Conservation (Natural Habitats &c) Regulations 1994 (as amended) and are known as European protected species.

4 Assessment of Environmental Impacts

The project plan has been developed to have a positive impact on local communities, social values and the local environment, and at the same time, minimise any potential disruption or nuisance. The project plan included close engagement with the local community to utilise local resources and maintain transparent two-way communication with all the stakeholders. Overall, XOCEAN considers USV operations to have a low environmental impact compared to a conventional vessel performing the same project.

XOCEAN consider the following areas to fall outside the requirements of the project and do not require any assessment:

- Mitigation of potential hazards to terrestrial life, including birds
- Protection of Biodiversity and Nature Conservation
- Protection of seabed stability and features of geological interest

Further impact analysis and mitigation measures are detailed section.

4.1 Environmental Statement

XOCEAN's USV is designed to reduce overall greenhouse gas emissions, pollution of air and water with gases and particulates disturbance to local communities and biodiversity.

XOCEAN has four Corporate 'Impact objectives' on Environment, Safety and Gender balance. The company is also committed to the UK government's net zero 2050 target on carbon emissions. The environmental impact objectives are:

- Over the next five years, XOCEAN will displace one million tons of carbon emissions.
- Over the next decade, XOCEAN will support the development of over 100 gigawatts of offshore wind.

The USV Carbon footprint details are found in the Project Carbon Footprint Estimate.

4.2 Emissions and Water pollution

Water pollution during USV operations and maintenance activities are emitted. These can cause disturbance to people and wildlife in the close vicinity (on-land or in the port environment), cause marine mammal disturbance while offshore or pollute the environment with bilge water from the vessel.

- Any bilge activation is recorded with the USV control system. XOCEAN has an action plan to decrease the number of activations with each mission and vessel build. No bilge water emptied from higher risk compartment within the USV, e.g. generator.
- The USV has a solar array to provide additional renewable energy while operating.
- The fuel usage of the USV is significantly lower than a conventional vessel required to conduct the same operations.

4.3 Anthropogenetic Noise

During USV operations and maintenance activities Anthropogenic Noise is emitted. This ambient noise can be produced by the vessel's movement, generator vibrations, or seismic noise generated during the geophysical surveys. This can cause disturbance to people and wildlife in the close vicinity, on-land or in the port environment, and cause disturbance to marine species while offshore.

Marine species predominantly use acoustic cues in the marine environment for navigation, communication, foraging, and predator avoidance. Cetaceans in particular, are impacted by the anthropogenic noise due to the range and frequency of the source.

Cetacean species can be classified into three functional hearing groups based on auditory sensitivity:

Low Frequency (7 Hz – 22 kHz), all baleen whales e.g., humpback whales, minke whales

Medium Frequency (150 Hz – 160 kHz), e.g., dolphins and killer whales

High Frequency (200 Hz – 180 kHz), e.g., harbour porpoises

The degree of sensitivity contributes to the potential of a disturbance or injury offence. Auditory injury is deemed to have occurred when there is a permanent shift in the hearing threshold of cetaceans. Note that auditory injury can result from very loud noises, even if they are not within the frequency range of the animal (i.e., they can't be heard by the animal but may still damage the structure of their ears).

4.3.1 Offshore impact

4.3.1.1 Ambient noise – continuous vessel noise

XOCEAN vessels generate low frequency noise levels from generators and thrusters that control movement and speed of the USV.

The overall ambient noise impacts from the USV are much lower in comparison to a conventional vessel with minimal impact on marine wildlife. XOCEAN noise measurements found the vessel runs at 54db(A) at 7m (at max rpm), with the generator being enclosed within a compartment. These levels are not seen to provide a threat to marine life.

The USV has a diesel micro-generator is a very efficient engine driven battery charger, with the charge output directly controlled by the engine speed; this leads to exceptionally high efficiency. The unit complies with fundamental health & safety requirements of the following European & North American directives & regulations (EU 2016/1628 Regulation, 2002/88/EC Directive, ISO 8178-1:2017-04 and ISO 8178-4:2017-04

4.3.1.2 Impulsive Seismic noise

Geophysical surveys are conducted by emitting pulses at the sea floor, depending on the frequency and source level these can pose significant impact for protected species in the local area.

XOCEAN utilises multibeam (MBES) and Innomar parametric sub bottom profiler (SBP) to survey the seabed. Details of the specifications below.

Function	Equipment	Comments
Survey Platform	XO-450	XOCEAN USV – specification in Appendix 1.
Primary Positioning System	Applanix POS MV Wavemaster II	
Primary Gyro and INS System	Applanix POS MV Wavemaster II	
Sonar System	Norbit B51s WINGHEAD	0.5-degree system, 200-700 kHz broadband multibeam sonar. Recording Backscatter.
Sound Velocity Measurement	Valeport miniSVS (at the MBES transducer) Valeport SWiFT SVP (winch deployment)	Winch deployment can be carried out while underway.
Sub-Bottom Profiler	Innomar SES-2000 Medium	Low Frequency 8-12kHz. SL(Peak) 247-250 (dB//1µPa@1m) SL(RMS) <243 (dB//1µPa@1m)

The frequency and source levels of the MBES is suggested to not require mitigation due to the frequency they work at being outside the SEL for marine mammals, XOCEAN however follows all best practice for mitigation and JNCC guidelines for seismic surveys. XOCEAN uses the lowest practical power levels during survey operations.

The Innomar sub-bottom profilers use the principle of "parametric" or "nonlinear" acoustics to generate short narrow-beam sound pulses. With the directional sound pulses used by the Innomar SBPs one can assume a marine mammal will leave the affected water volume as fast as possible. Therefore, considering an exposure time of 1 hour, the Innomar SBPs narrow sound beams produced,

means that this equipment will have the lowest impact. Models suggest the SEL of the SBP is below known limits which marine mammals are considered to be safe, are exceeded in a very small volume directly below the transducer only.

This equipment has been selected as it can produce the required data, at the lowest levels of disturbance to the environment. To further reduce the impact on marine species, XOCEAN follows all JNCC guidelines, and no sound source will be knowingly switched on in the presence of a marine mammal.

4.3.2 Onshore impact

Maintenance facilities are selected in industrial areas and away from residential areas to reduce any noise impact from maintenance works.

4.4 Impacts on Biodiversity and Historical and Cultural Heritage

XOCEAN has reviewed the available data sources on nature conservation and heritage that cover the project area. The images below summarise environmentally sensitive or conservation designation areas in the vicinity of the project.

4.4.1 Marine protected Area's (MPA)

The HR state areas of core habitat for species listed under Annex II of the EUHD must be considered for designation as a Special Area of Conservation (SAC). The common bottlenose dolphin, harbour porpoise, grey seal and harbour seal are all listed under Annex II. Therefore, some SACs are designated with marine mammals as their qualifying feature. Until such time when the site is rejected or approved, it is deemed a Candidate SAC (cSAC), or if before the UK's exit from the EU, a Site of Community Importance, SCI). The CHSR states cSACS and SCIs must be given the same level of protection as approved SACs, and will be subject to a Habitat Regulations Assessment (HRA) for any operations occurring within their boundaries.

The Shetland isles are a designated Important Marine Mammal Area (IMMA), due to its high diversity and abundance levels for marine mammal species and is importance during key life stages of the marine species during seasonal migrations and reproduction.

Figure 1- Shetland & Fair Isle IMMA

There are also three marine protected areas (MPA) in the proposed working areas from the project, these include Sullom Voe, East midland Coast (Shetland) and site of special scientific interest, Yell Sound Coast.

These sites are designated, under the OSPAR Commission, JNCC & Nature England to:

- Protect, conserve and restore species, habitats and ecological processes that have been negatively impacted by human activities.
- Prevent degradation and damage to species, habitats and ecological processes, based on the precautionary principle.
- Protect and conserve areas that best represent the variety of species, habitats and ecological processes present within the marine area.

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Figure 2: Marine protected areas in planned Shetland working area.

Due to the close proximity of these designated sites to the proposed survey area, XOCEAN recognises that there is potential for interaction with qualifying and interest features associated with these sites.

XOCEAN aims to mitigate all impacts to the best of their ability. All XOCEAN operations are designed to not harm or damage biodiversity.

XOCEAN follow any survey licence obligations and relevant jurisdictional guidance associated with geophysical survey activities. Further detail on marine noise mitigation is provided in the ‘Reduction of noise and emissions’ section above.

4.4.2 Historical & Heritage areas

XOCEAN acknowledges that the project activities could impact historical, cultural or heritage sites and local communities. The project team actively engages with local stakeholders to understand and mitigate against local cultural and heritage requirements. All XOCEAN operations are designed to not harm or damage biodiversity.

The desktop study of the survey area and the locations of XOCEAN's onshore activities have not identified any historic or cultural sites, including places with significance importance to indigenous peoples. If, during the mobilisation or survey execution phase of the project, sites are brought to the attention of XOCEAN, any planned activities will be cancelled and replanned to avoid the site.

5 Assessment of Alternatives

XOCEAN have considered alternatives to the proposed geophysical surveys. The alternatives identified are the use of different equipment or 'do nothing' scenario consisting of not undertaking the proposed site investigation surveys.

5.1 Alternative Option 1 – Use different equipment:

The combination of the level of geophysical survey equipment have been chosen to provide the most efficient dataset that can be used to assess engineering feasibility. The equipment proposed for the survey has been assessed on the worst case for potential marine mammals' impacts, the alternative options to MBES and SBP, such as airguns and side scan sonar, to undertake pre-construction surveys have a much greater source levels causing greater impact on the protected species in the areas. To further minimize the impact XOCEAN have selected the make and model of the equipment taking in mind the impact and selected specifications that will have minimal impact on the marine species, as shown in section 4.3.1.2.

Traditional crewed geophysical survey could be undertaken with greater environmental impact. Should these surveys be conducted with a traditional vessel the ambient noise source levels generated during the transit is estimated to be, generate (59-171dB re 1µPa m) of low frequency (less than 250Hz) (Evans, 1996 cited in Evans, 2003). XOCEAN's USV's source levels is estimated to generate <11dB re 1µPa making XOCEAN option a unobjective benefit in comparison to the noise pollution generated by larger vessels. In addition to this a larger array would be utilised by larger vessels generating a multiple larger source noises in comparison to XOCEANS, single array.

Our USV technology is also low carbon against conventional survey tonnage and also The USV is 4.5m in length and weighing 1150kg, thrusters have protectors over the blades. The size and weight of the USV poses a minimal impact in comparison to larger vessels, in regard to vessel strike avoidance and disturbance, lightweight, reducing the potential impacts of vessel strike and disturbance.

Overall, the proposed works meet the objectives of the preliminary survey with the minimal practicable impact to marine mammals.

5.2 Alternative Option 2 – 'Do Nothing' Scenario:

The proposed geophysical surveys will provide details on the seabed condition and existing pipelines to provide guidance for future developments and maintenance. A 'do nothing' alternative through the use of pre-existing data for a desktop review presents significant risks to as it wouldn't identify any obstructions, including unknown changes to seabed conditions, and faults to existing equipment, resulting in any damage to the environment and offshore works within the Development site. Although this would ensure there is no potential for disturbance to marine mammals, the option is assessed as being non-viable due to the health and safety risk to the environment should a spill take place & personnel involved in offshore installation works of potential developments.

In addition, should XOCEAN USV's not be used, additional surveys with larger vessels for multiple campaigns would need to be employed by the developers to cover multiple scopes from multiple clients. XOCEAN surveys collect data that can be available for any interest in organisations working in those areas.

5.3 Alternative Option 3 – Different timing:

Geophysical surveys are required to map the seabed characteristics and identify possible maintenance requirements and other seabed obstacles. Conducting the surveys from January to March, outside the summer season with the highest potential impact for EPS species, the surveys are scheduled to take place during the lowest abundance & distribution for some key protected species such as basking sharks and minke whale. Due to these mitigations already in place, changing the timing will negatively impact the potential disturbance to these species so we suggest it wouldn't be effective option.

Due to the risk that may be incurred by not conducting these surveys, both environmental and commercially, we considers that the 'no satisfactory alternative test' has been met.

5.4 Alternative Option 4 – different locations

The locations XOCEAN aim to survey have been selected through desktop investigation for areas of high priority for multiple existing and/or future pipelines and export cables. Where areas overlap with marine protected areas, we investigated opportunities to avoid these areas minimising the disturbance to these areas and protected species that inhabit them.

Due to the seabed conditions the location of these cable & pipeline routes is specific to the terminals they will be terminated at; the location of these surveys cannot be moved. Moving the location of the survey would provide unnecessary disturbance in an area that would not provide valuable data and further surveys in the correct area would then have to be conducted at a later date.

Due to the specifics of locations XOCEAN plan to follow only the potential corridors to mitigate any unnecessary disturbance due to the Shetlands IMMA and additional protected areas.

6 Mitigation of potential hazards to marine life from anthropogenic noise

Assessment of the impacts of our works highlight that Anthropogenic noise has the largest impact on the environment and with XOCEAN operations being the most suitable alternative, additional mitigation is included to minimise remaining impacts.

Where a license is required for geophysical operations, license conditions set out by regulators specify that compliance with a set of mitigation guidelines must be followed. These guidelines have been produced by the JNCC and can be found in the JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys' (JNCC, 2017). Although variations to standard procedure may be permitted through consultation on an individual basis, general mitigation measures as per the JNCC guidelines include the following in relation to seismic operations *e.g.* airguns.

The guidelines relate to all marine mammals encountered in UK waters (including seals). Although less frequently encountered, it is suggested the guidelines are applicable to turtle species and the European Sturgeon if encountered during survey operations. The guidelines are also applicable to the basking shark within UK inshore areas.

For operations within the Scotland

6.1 Vessel strike avoidance

Due to the size of the USV, its impact on marine life is considered low. The USV is shallow drafted and operates at slow speeds, and the thrusters are fitted with guards. These factors result in a low chance of striking a marine mammal or protected species and causing any damage to the marine mammal.

6.2 Anthropogenic sound

The noise levels as discussed in section 4.3. will have an impact on protected species in the area. XOCEAN follow any survey licence obligations and relevant jurisdictional guidance associated with geophysical survey activities. Further detail on project specific species are in section 3.1.1.

Country / legislation	MMO	Mitigation zone (m)	Pre-watch duration	Soft start	Delay from sighting of marine mammal	PAM	Comments/ reference documents
UK JNCC	JNCC certified MMO	500m around source	30mins in water <200m 60mins in water >200m	Min 20 mins	20mins	Should be considered for 24hour operations	JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys

6.3 Detailed XOCEAN mitigation procedure

XOCEAN hire JNCC certified MMO's to be stationed on the support vessel for all start up operations during the project.

6.3.1 Start up of Sub-bottom Profilers.

The following section outlines the procedural steps required for a safe startup of the SBP:

Inside Port

- The SBP should remain switched off following launch of the USV to water, if alongside or during the escorting of USV out of the port.

Local to Port

- A MMO will be embarked on the escorting vessel when accompanying the USV to open water.
- Once the USV and escort vessel are beyond the port limits, the MMO will start lookouts for mammals or signs of their presence within 500m of the USV. The escort vessel should remain <100m from the USV during this watch.
- After a period of 30 minutes, if no mammals are spotted with 500m of the USV then the MMO will give the go ahead to the Field Operative (to communicate to the Surveyor/Pilot) that the SBP can be switched on and set to 20% power output.
- However, if during the 30-minute watch period a mammal is spotted within the 500m zone then the soft start will be delayed by 20 minutes, after the last mammal detection.
- Once the SBP is switched onto low power, referred to as the “soft start”, after 20 minutes have elapsed then the MMO will give the instruction that the SBP output can be increased to full power.

The start and end timings of both the mammal watch and the soft start should be clearly recorded in the Survey Log. If an offshore location has been used for the startup rather than just local to the port, then the location coordinates of the USV should be noted in the log also.

6.3.2 Transit to Survey Site

After a completed start-up of the SBP there will often then be a period of transit for the USV to reach the survey location. Two options are shown below:

- If acquiring data on passage: SBP running at full / acquisition power level.
- No acquisition of data on passage: Run SBP at reduced power until reaching survey location.

Note: With some types of seismic sources, the firing/activation interval can also be adjusted and increased to reduce noise entering the environment over time. With the SBPs equipped on the USVs (Innomar), this is not possible, as the activation is controlled/guided by the running of MBES.

6.3.3 Within the Survey Area

Offshore Standby:

During any period of standby offshore (marginal weather, area access), ideally reduce the power down of the SBP to 50% or lower but must not be switched off.

Technical Issue:

In the event of a technical issue with the USV or survey spread which requires a shutdown of the SBP for greater than 10 minutes, a new watch and soft start would be required. During this type of event the source power and trigger rate should be minimised. The SBP should only be switched off if the issue demands it (power saving) or the decision is made for a transit to port / emergency tow in.

6.3.4 Shutdown of SBP

Once all data collection is confirmed as complete, be that onsite for a commercial project or at the end of transit where data is being collected, the Surveyor can switch of the SBP.

The time of switch off should be recorded in the Survey Log, this information will later be provided to the MMO report writer so that the total time the SBP was running is reported.

6.4 Mitigation Reporting

The MMO on the support vessel will keep a record of the timings of when the various procedures occur during a mission. This information forms part of any reporting required by the Regulatory.

In order to satisfy the Regulator, he consent holder/Operator is required to submit the following items (produced by the Survey Contractor):

- MMO Report: providing a summary of survey specific – mitigation watches and required mitigation actions as per the consent.
- Marine Mammal Recording Form: JNCC produced Excel log sheet.
- JNCC Noise registry

Usually, these must be supplied within 4 weeks of the expiry of the consent. Further details regarding what an MMO Report should contain can be found in Appendix 2 of the JNCC guidelines (see reference section).

7 Summary and Closing statements.

7.1 Environmental benefits

XOCEAN Surveys will conduct comprehensive monitoring of existing infrastructure, assessing factors such as structural integrity and environmental impact to identify potential risks to both the ecosystem and local personnel. The findings will facilitate the safe development and maintenance of new renewable energy sources, which will benefit both residents of Scotland and the broader UK. By promoting sustainable energy solutions, this initiative plays a crucial role in supporting the UK's ambitious commitment to achieve net-zero carbon emissions by 2050, fostering a cleaner and more sustainable future for all.

Conducting surveys with XOCEANS USVs offers significant environmental benefits compared to larger geophysical survey vessels. The use of low-impact equipment on USVs minimizes disturbance to sensitive seabed areas, particularly in the Shetland Isles. By collecting data from these seabed surveys, we can identify suitable areas for cable and pipeline routes that are situated outside of the protected zones, such as Yell Sound and Sullom Voe. This approach will help ensure the protection of these sensitive environments while allowing for necessary development.

7.2 Local benefits

In addition to the environmental benefits of XOCEAN’s surveys XOCEAN focus is on building local connections and economies during projects. During operations we work closely with local fisheries to boost connections and positive associations with our work in those areas, to minimize the conflicts rising from our work and respecting existing practices in the area. We work with local businesses to support our operations, providing alternate employment for fisheries during seasonal downtimes as support vessels for our craft, as well as, using local businesses for storage and maintenance of our equipment.

Working with local fisheries support with the project, we engage with harbours and fishermen in advance of all of our work to reduce the negative perspective on survey works and offshore developments in the area's. By performing outreach, it give them a face to turn to answer questions and provide local point of contact to give them a voice within the industry and modify our practices to prevent these conflicts in the future. This also allows us to navigate and build connections for return projects.

7.3 Closing statement

If the work does not proceed, we will be unable to identify the condition of existing infrastructure and the potential risks to future developments. This could negatively affect the supply of renewable energy and have significant adverse socio-economic consequences. Additionally, it may pose a hazard to other legitimate users of the sea if any obstructions or damages are left unaddressed.

XOCEANS' survey practices are meticulously designed to account for the potential environmental and social impacts in the specific regions being surveyed. By implementing a low-impact solution, we effectively reduce the reliance on larger vessels and the necessity for multiple survey campaigns. This approach not only minimizes disturbances to sensitive ecosystems but also mitigates additional threats to critical marine mammal habitats, particularly in areas like the Shetland Islands, which are renowned for their biodiversity. Our commitment to protecting these environments allows us to conduct thorough surveys while safeguarding the well-being of marine life and the integrity of their habitats.

8 Abbreviations and Definitions

ALARP	As Low As Reasonably Practicable
CAD	Computer-Aided Design
DGPS	Differential Global Positioning System
DOL	Depth of Lowering
DPR	Daily Progress Report
DTM	Digital Terrain Model
DWG	Drawing file extension
EPSG	European Petroleum Survey Group
ERF	Emergency Response Flowchart
ERP	Emergency Response Plan
ESRI	Environmental Systems Research Institute, Inc. (the company that has developed the ArcGIS software)
FME	Feature Manipulation Engine (ETL software developed by Safe Inc.)
FMGT	Fledermaus GeoCoder Toolbox
GAPS	Global Acoustic Positioning System
GIS	Geographic information system
GNSS	Global Navigation Satellite Systems
GPS	Global Positioning System
HDD	Hard Disk Drive
HIRA	Hazard Identification and Risk Assessment
HSE	Health, Safety and Environment
HSEQ	Health, Safety, Environment and Quality
IAC	Inter Array Cable
IMO	International Maritime Organization
IMU	Inertial Measurement Unit
INS	Inertial Navigation System
ITRF	International Terrestrial Reference Frame
JMP	Journey Management Plan
km	kilometre
KP	Kilometre Post used to describe distance along a route (design)
KPI	Key Performance Indicator
LARS	Launch and Recovery System
LAT	Lowest Astronomical Tide (vertical datum)
m	metre
MAC	Mobilisation and Calibration
MASS	Maritime Autonomous Surface Ships
MBES	Multibeam Echo Sounder
MMO	Marine Management Organisation
MRU	Motion Reference Unit
MS	Management System

MSL	Mean Sea level (vertical datum)
NCR	Non-Conformity Report
OM	Operations Manager
PDF	Adobe Portable Document Format
PPS	Pulse Per Second
PTW	Permit to Work
QA	Quality Assurance
QC	Quality Control
QCS	Quality Control System
QINSy	Quality Integrated Navigation System
RC	Report Coordinator
RMS	Root Mean Square
RPL	Route Position List
SBET	Smoothed Best Estimated Trajectory
SBP	Sub-bottom Profiler
SD	Standard Deviation
SOW	Scope of Work
SSS	Side Scan Sonar
SV	Sound Velocity
SVP	Sound Velocity Profile
TBA	To be announced
TBD	To be decided
TBT	Toolbox talk
TBU	To be updated
THU	Total Horizontal Propagated Uncertainty
TPU	Total Propagating Uncertainty
TSS	Traffic Separation Scheme
TVU	Total Vertical Propagating Uncertainty
UK	United Kingdom
UTC	Coordinated Universal Time
UTM	Universal Transverse Mercator
VORF	Vertical Offshore Reference Frame
VTR	Vertical Reference
WD	Water Depth
WE	Work Element (as per ITT)
WGS84	World Geodetic System 1984
WTG	Wind Turbine Generator