Joint Venture bp/EnBW

# Morven Environmental Support

## Borehole Marine Licence Supporting Information for 2023 campaign

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# ACRONYMS

| ACRONYM | DEFINITION |
|---|---|
| BGS | British Geological Society |
| bp | British Petroleum Alternative Energy International Ltd |
| BWM | Ballast Water Management |
| cm/s | Centimetres per Second |
| CNS | Central North Sea |
| CPT | Cone Penetration Test |
| EnBW | Energie Baden Württemberg |
| EUNIS | European Union Nature Information System |
| GW | Gigawatts |
| ICES | International Council for Exploration of the Sea |
| IMO | International Marine Organisation |
| kW/m | Kilowatts per metre |
| km | Kilometres |
| $km^2$ | Square kilometres |
| m | metres |
| mm | Millimetres |
| $m^2$ | Square metres |
| $m^3$ | Cubic metres |
| MARPOL | International Convention for the Prevention of Pollution from Ships |
| MEPC | Marine Environmental Protection Committee |
| MHWS | Mean High Water Spring |
| MSL | Mean Sea Level |
| NC MPA | Nature Conservation Marine Protected Area |
| nm | nautical miles |
| NMFS | National Marine Fisheries Service |
| NMPi | National Marine Plan Interactive |
| NNMS | Non-Native Marine Species |
| PCPT | Deep Push Cone Penetration Test |
| PMF | Priority Marine Feature |
| SEPA | Scottish Environment Protection Agency |
| SMRU | Seal Mammal Research Unit |
| SMWWC | Scottish Marine Wildlife Watching Code |

| ACRONYM | DEFINITION |
|---|---|
| SOPEP | Shipboard Oil Pollution Emergency Plan |
| USBL | Ultra-Short Baseline |
| WFD | Water Framework Directive |

# 1 INTRODUCTION

## 1.1 Project Background

bp Alternative Energy International Ltd (herein referred to as bp) and Energie Baden Württemberg (herein referred to as EnBW) have been awarded the lease of the western section of ScotWind E1 area, referred to as Project Morven. The plans for the 856.8 km$^2$ array site will be to develop an offshore wind project with up to 2.9 gigawatts (GW) generating capacity.

bp and EnBW wish to progress with the investigation and development of the Project Morven site. The Project Morven offshore wind farm (OWF) array area is located solely within the Offshore Scottish marine area (between 12 nautical miles (nm) and 200 nm from Mean High-Water Spring (MHWS)). The project area is located approximately 61 km from the eastern Scottish coastline at its closest point, in a water depth of approximately 62-77 m below Mean Sea Level (MSL) as shown in Figure 1-1.

It should be noted that previous geophysical and environmental surveys and geotechnical cone penetration tests (CPT) surveys have been undertaken in 2022 within the Project Morven site. However the scope discussed in this document relates to additional geotechnical surveys comprising of borehole sampling and CPTs across the site to characterize the soil conditions.

## 1.2 Document Purpose

This document has been prepared in support of the Marine Licence application for the borehole survey within the array area. It is intended to provide the regulatory authorities (and their statutory advisers, where relevant) with the necessary supporting information to inform the Marine Licensing process.

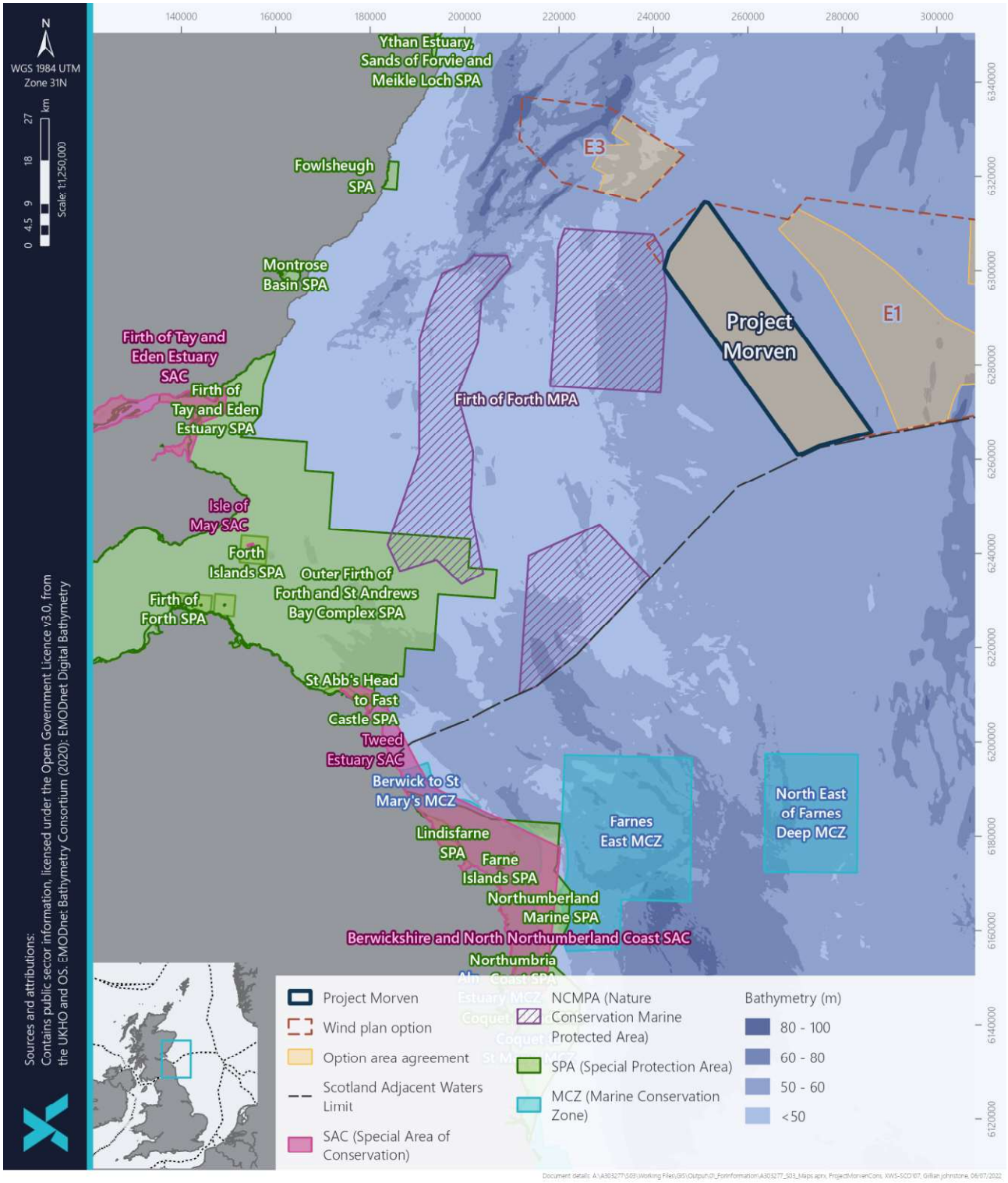
## 1.3 Permit and Licence Requirements

Under the Marine and Coastal Access Act 2009, a Marine Licence is required when the volume of sediment remove is > 1 m$^3$ per sample. bp and EnBW are intending to remove > 1 m$^3$ of sediment per borehole during the proposed survey.

As a part of this investigation, bp and EnBW plan to undertake in 2023 a borehole survey campaign with optional downhole CPTs across the site.

Ultra Short Baseline (USBL) (acoustic positioning system) will also be used during the proposed survey activities. Operations will occur outwith the Scottish territorial wates (i.e. >12 nautical miles) no impacts at population level are expected (see Section 3.6 for further details). Based on this, an European Protected Species (EPS) licence is not required for the use of USBL. All activities will adhere to the Scottish national marine plan to ensure marine resources are used sustainably.

*Figure 1-1 Overview of Project Morven Location*



# 2 SITE INVESTIGATIONS

bp and EnBW are developing Project Morven and wish to further investigate the potential OWF array area.

As a part of this investigation, bp and EnBW plan to undertake in 2023 a borehole survey and downhole CPT survey campaign across the array area. The aim of the survey will be to investigate the distribution, thickness and geotechnical properties of the upper 90 m of the seabed to provide a better understanding of the geological and geotechnical characteristics across the site.

This document has been compiled to cover the scope of works anticipated to be undertaken across the Project Morven site. The survey is expected to commence by 1st of June 2023.

The survey will be conducted within the Project Morven lease area in a water depth of approximately 62-77 m below MSL. This survey is anticipated to take between 60-120 days to conduct and will be undertaken by a geotechnical drillship (i.e., the survey vessel) as well as a deep push cone penetration test (PCPT) vessel.

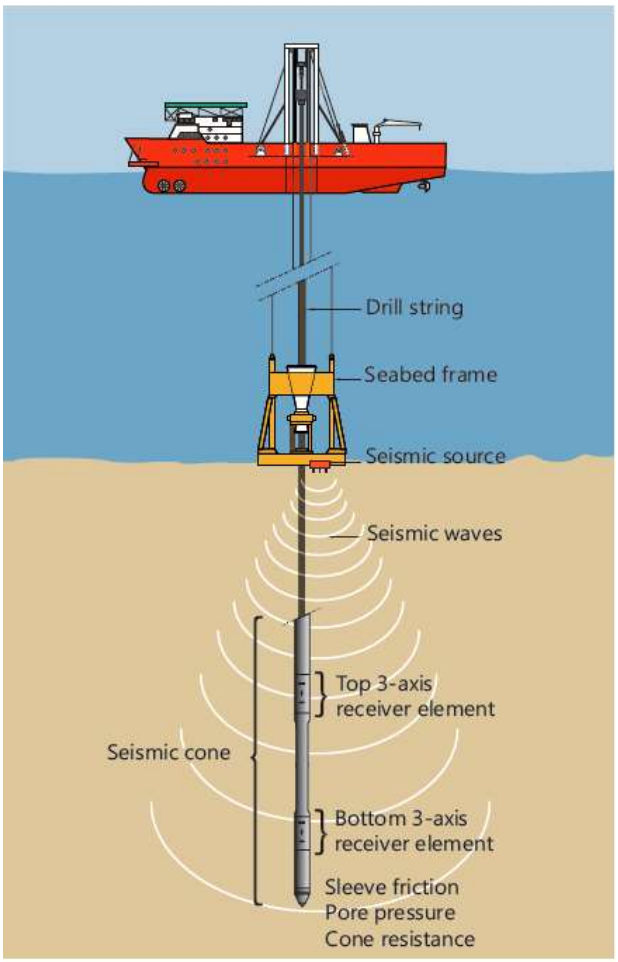
The estimated completion date is the end of October 2023 subject to volume of scope, weather and operational performance. However, to account for operational delays, this permit will be applied for to cover up until 1st June 2024.

It is expected that as a maximum, there will be up to 30 boreholes undertaken across the Morven site to a maximum depth of 90 m below the seafloor followed by CPTs in each borehole.

Samples of soil and rock up to 102 mm diameter will be collected from the boreholes. It is anticipated that up to 2.83 $m^3$ will be removed per borehole location, however depending on the drilling equipment and casings used this could vary. Boreholes will be advanced through a combination of piston/push/hammer sampling switching to drilling at rock head where required. It should be noted that no sediment will be collected as part of the CPTs.

Following drilling operations geophysical logging will take place. Optionally, execution of seismic CPTs will take place to complement borehole data. Doing so will allow for a comprehensive evaluation of subsurface conditions. Downhole geophysical logging will involve a high-resolution Acoustic televiewer, 3-arm calliper, natural gamma radiation and P-S logger. Seismic waves emitted by these operations will be highly directional (Figure 2-1). Therefore, downhole geophysical logging is not expected to significantly alter background noise levels in the water column and no further impacts are expected.

*Figure 2-1 Seismic CPT Operations*




In addition, there may be the requirement for up to 20 deep-push seabed CPTs (PCPT) going to a maximum depth of approximately 60 m in order to better analyse subsurface conditions. The PCPTs will be deployed from a separate vessel to the geotechnical boreholes. The vessel will deploy a PCPT system (e.g. Figure 2-2) on the seabed to allow for greater penetration capacity. The system will drive the cone into the seabed at the standard rate of 2 cm/s, measuring cone resistance, sleeve friction, inclination and pore pressure. PCPT cones of 10 $cm^2$ will be provided to allow for testing of soil conditions The PCPTs will continue until target depth, maximum thrust of the equipment has been achieved or refusal occurs (e.g., due to reaching weathered or pure bedrock). PCPTs do not involve the removal of any seabed sediment and therefore considered an exempt activity under the Marine and Coastal Access Act 2009.

*Figure 2-2 Example SEACALF MKV PCPT System from Fugro*

Specific borehole locations have not yet been determined but will be spread across OWF array area. Specific locations will be based on previous survey activities. Prior to any work taking place, all sites will be screened for unexploded ordnance (UXO), geological hazards, archaeological features and any sensitive benthic habitats or species. This approach has been agreed with Lauren Cowan of MS-LOT by email on the 18th November 2022.

UBSL systems will be used during the survey campaign to determine the position of boreholes and CPTs. This involves the emission of sound from a vessel-mounted transducer to a subsea transponder, thereby introducing sound into the marine environment. An USBL system consists of a transducer, which is mounted on the vessel and a transponder attached to the underwater device. The transducer transmits acoustic signals 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 underwater device is determined. These systems can either be used continuously or intermittently through the operation they are supporting.

The work will be conducted by a survey vessel and a PCPT vessel, both of which will be equipped with a dynamic positioning system. Therefore, no direct interaction between the survey vessel and seafloor will occur. For execution of drilling operations and CPT pushes, a seabed frame or PCPT system will be lowered and after execution lifted back to deck. The potential footprint for the seabed frame on the seafloor is approximately 5 m x 5 m (so 25 $m^2$) depending on selected equipment. The potential footprint of the PCPT system is 3 m x 3 m (9 $m^2$).

# 3 ENVIRONMENTAL CONSIDERATIONS

## 3.1 Bathymetry and Seabed Conditions

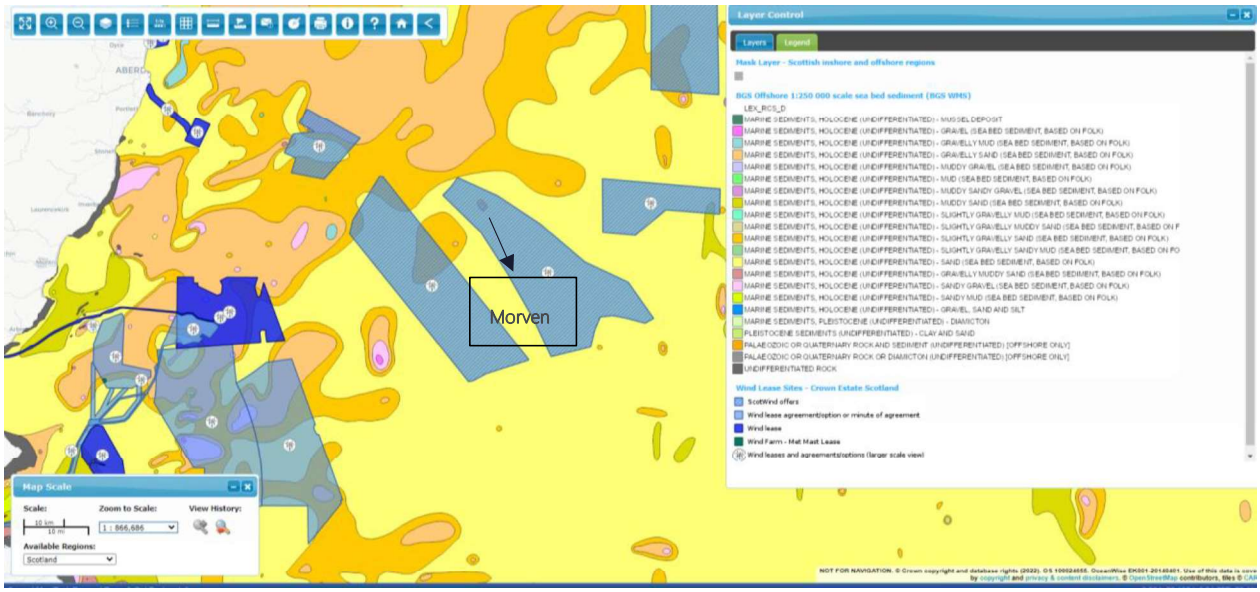
### 3.1.1 Summary of Baseline

Offshore tidal current velocities in the region are between 0.01-1.0 m/s during mean spring tides (DECC, 2016). The mean residual currents surrounding the Project Morven site is approximately 0.01 m/s (Wolf *et al.* 2016).

According to the National Marine Plan interactive (NMPi) tool (2023), the annual mean wave height in the region of the proposed survey area is between 1.21 – 1.5 m and the annual mean wave power is 6.1 – 12.0 kW/m.

The Department of Energy and Climate Change (DECC) (now the Department of Business, Energy and Industrial Strategy) (2009; 2016) reports that sand and slightly gravelly sand covers much of the seabed of the Central North Sea (CNS) region and occurs within a wide range of water depths from the shallow coastal zone to 110 m in the north and to below 120 m in isolated depths. Sediments may have a significant mud content, particularly in basins and in deeper waters to the north (NMPi, 2023). Coastal areas in the region support a more varied range of intertidal and seabed habitats (DTI, 2004) with sediments data from the British Geological Society (BGS), as reported in the NMPi tool (2023), reporting that the proposed borehole survey area is dominated by sand and slightly gravelly sand (Figure 3-1). In addition, Project Morven is located within the Priority Marine Feature (PMF) habitat 'Offshore subtidal sand and gravels' (NMPi, 2023), which is a widespread habitat in the North Sea.

*Figure 3-1 BGS Sediments in the Vicinity of Project Morven (NMPi, 2023)*



### 3.1.2 Assessment of Potential Effects

Potential effects on sediments during the proposed borehole survey may arise from direct physical disturbance to the seabed and habitat loss or alteration. As stated in Section 2, seabed disturbance will occur from up to 30 boreholes and seabed frame. Collectively, each borehole will impact a volume >1 $m^3$ and the seabed frame will impact an area footprint of 25 $m^2$ at each borehole location. There will also be a maximum area of impact of 9 $m^2$ at each PCPT location due to the PCPT system. The seabed frame and PCPT system will not be used at the same location, so no more than 25 $m^2$ of seabed will be impacted at a given location. There is little quantitative information on the likely recovery time from the physical disturbance although indications are available from studies carried out on seabed disturbance by towed fishing gear (as reviewed by Løkkeborg, 2005). These suggest that it is likely that some level of recovery will occur in the sediments. The longevity of the physical scars or depressions in the seabed is dependent on the type and energy of the local benthic environment. Scars in high energy sandy environments may disappear within months of the initial disturbance, whilst those in slightly gravelly sand deeper areas may still be visible after 18 months. Downhole geophysical logging is not expected to have any further impacts on the marine environment due to the emitted seismic waves being highly directional.

Most sediments identified in the Project Morven area exhibit good potential to recover from physical disturbance, particularly as proposed works will be localised and short-term. In addition, the borehole will backfill naturally. Some more disturbed areas may be slower to recover than others, but it is anticipated that all areas will recover over time. It is therefore considered that the impact of direct physical disturbance of sediments during the proposed survey will be of negligible significance.

## 3.2 Benthic Ecology

### 3.2.1 Summary of Baseline

NMPi (2023) shows the broad scale habitat of the proposed borehole survey area as European Union Nature Information System (EUNIS) biotope complex MC5 'Circalittoral Sand' and MD3 'Offshore Circalittoral Coarse Sediment'. Further details on these sediment types are detailed below (European Environmental Agency, 2022):

- MC5 sediment types are coarse sediments in the circalittoral zone including coarse sand, gravel, pebbles, shingle and cobbles which are often unstable due to tidal currents and/or wave action. These habitats are generally found on the open coast or in tide-swept channels of marine inlets. They typically have a low silt content and a lack of a significant seaweed component. They are characterised by a robust fauna including venerid bivalves.
- MD3 sediment types offshore (deep) circalittoral habitats with coarse sands and gravel or shell. This habitat may cover large areas of the offshore continental shelf, although there is relatively little quantitative data available. Such habitats are quite diverse compared to shallower versions of this habitat and generally characterised by robust infaunal polychaete and bivalve species.

The Project Morven is located in close proximity to the Firth of Forth Banks Complex Nature Conservation Marine Protected Area (NC MPA), which is designated for the presence of the Priority Marine Feature (PMF) ocean quahog *Arctica islandica* (see Section 3.5 for further details on designated features). A review of the known occurrence of

ocean quahogs in NMPi (2023) was undertaken. Only one known occurrence of ocean quahog was recorded in the south-east area of the Project Morven area.

### 3.2.2 Assessment of Potential Effects

Potential effects on benthic ecology during the proposed survey may arise from direct physical disturbance and habitat loss or alteration. However, most subtidal species and biotopes identified in the vicinity of the Project Morven area exhibit good potential to recover from physical disturbance, particularly as proposed works will be localised and short-term. It is anticipated that the benthic community impacted will recover and species richness, with re-establishment, improved following subsequent spawning and recruitment periods.

Ocean quahog have been recorded in the vicinity of Project Morven (NMPi, 2023); however they have not been recorded in high numbers in the OWF array area. Disturbance to the seabed as part of the survey will be discrete at each of the 30 borehole locations. Based on the localised nature of the survey, it is not expected that disturbance to the seabed would affect ocean quahog at population level.

Some more disturbed areas may be slower to recover than others, but it is anticipated that all areas will recover over time. It is therefore considered that the impact of direct physical disturbance of benthic species and habitats during the proposed survey will be of negligible significance. Potentially affected habitats and species are anticipated to recover quickly in the area and are not expected to be impacted at a population level.

## 3.3 Fish and Shellfish

### 3.3.1 Summary of Baseline

A number of commercially important fish and shellfish species can be found in the vicinity of Project Morven borehole survey.

The proposed survey area is located in International Council for the Exploration of the Sea (ICES) rectangles 42E8, 42E9 and 41E9, in an area of spawning and nursery grounds for several commercially important species. This is summarised below (Coull *et al.*, 1998); Ellis *et al.*, (2012):

- Spawning species found within the area include: cod *Gadus morhua*, herring *Clupea harengus*, lemon sole *Microstomus kitt*, Nephrops *Nephrops norvegicus*, plaice *Pleuronectes platessa*, sandeels *Ammodytes tobianus*, sprat *Sprattus sprattus*, whiting *Merlangius merlangus*.
- Nursery species found within the area include: anglerfish *Lophius Piscatorius*, blue whiting *Micromesistius poutassou*, cod, common skate *Dipturus batis*, European hake *Merluccius merluccius*, haddock *Melanogrammus aeglefinus*, herring, lemon sole, ling *Molva molva*, mackerel *Scomber scombrus*, *Nephrops*, Norway pout *Trisopterus esmarkii*, plaice, saithe *Pollachius virens*, sandeels, spotted ray *Aetobatus narinari*, sprat, spurdog *Squalus*, tope shark *Galeorhinus galeus*, whiting.

It should be noted that the ICES rectangles are located within an area experiencing periods of high intensity nursery for cod and herring and a high intensity spawning area for sandeels (Ellis *et al.*, 2012). Findings from González-Irusta and Wright (2016) as reported on the NMPi (2023) tool, shows that cod spawning in the Project Morven area ranges from "unfavourable" to "recurrent".

Of the species listed above, the following are listed as a Scottish PMF: anglerfish, blue whiting, cod, herring, ling, Norway pout, saithe, sandeels, spurdog and whiting (NatureScot, 2020).

Of the species that spawn in ICES rectangles 42E8, 42E9 and 41E9, herring, Norway lobster, sandeels and plaice are benthic spawning species.

Herring are demersal spawners, depositing their sticky eggs on coarse sand, gravel, small stones and rock. Shoals of herring gather on the spawning grounds and spawn more or less simultaneously. Each female releases her eggs in a single batch and the resulting egg carpet may be several layers thick and cover a considerable area (DECC, 2016). The drift rate of the larvae is variable, and it is probable that in some years many of them do not reach the nursery areas (Scottish Government, 2017).

Norway lobster are widely distributed on muddy substrata throughout the northeast Atlantic (Sabatini and Hill, 2008), and spawn all year round. Norway lobster construct their burrows in muddy sediments and their range is limited by the availability of suitable sediment, which ranges from sandy mud (70% sand, 30% silt and clay) to very soft mud (100% silt and clay) (Cefas, 2001; Scottish Government, 2017). They spend most of their time in their burrows, only coming out to feed and look for a mate. They carry their brood under their tails until they hatch and disperse as planktonic larvae (Scottish Government, 2017).

There are five species of sandeel known to occur in the North Sea, with the majority (90%) of the commercial catch made up of the lesser sandeel *Ammodytes marinus*. Sandeel are shoaling fish which lie buried in the sand during the night, and hunt for prey in mid-water during daylight hours (DECC, 2016). They are restricted to sandy sediments (Holland *et al.*, 2005; DECC, 2016). They feed mainly on planktonic prey such as copepods and crustacean larvae, but they also consume polychaete worms, amphipods, and small fish including other sandeel. When active, sandeel swim continually to remain clear of the bottom (DTI, 2001). Sandeel usually spawn between November and February and lay eggs in clumps on sandy substrates (DECC, 2016). The larvae are pelagic for approximately two to five months after hatching and are believed to over-winter buried in the sand (DECC, 2016). Sandeel are important not only to commercial fisheries but also are also of ecological significance as they are a vital food source for marine birds and predatory fish (DECC, 2016). According to Holland *et al.*, (2005), sandeels are likely to avoid areas with greater than 4% of silt/clay or very fine sand. Additionally, according to Jensen *et al.*, (2011) most sandeel species inhabit shallow, turbulent sandy areas, located at depths of 20–70 m where the content of the finest particles of silt and clay is low.

Important spawning grounds for plaice were identified in the eastern English Channel, Trevose Head and eastern and western Irish Sea (CEFAS, 2001). Plaice spawn at the seabed, but eggs and larvae are pelagic. Sediment characteristics are thought to be of importance. Larval plaice use sandy beaches and coastal estuaries as nurseries (DECC, 2016). The preference for sandy sediments remains during the entire lifespan, although older age groups may be found on coarser sand (Ruiz, 2007) and older individuals are usually found in deeper water than younger individuals (DECC, 2016).

The sediment regime in the proposed borehole survey area consists of sand and slightly gravelly sand and therefore it is likely that these species may spawn in the area from time to time.

### 3.3.2 Assessment of Potential Effects

The proposed survey has the potential to directly affect fish and shellfish ecology in terms of direct disturbance to the seabed and habitat loss along with the subsequent sediment deposition as well as survey and PCPT vessel sound. This in turn may affect associated spawning, nursery, feeding habits and migration.

As discussed in Section 3.1, the proposed borehole survey area is dominated by sand and slightly gravelly sand. Seabed disturbance has the potential to impact on benthic spawning fish species. As discussed in Section 3.3.1 herring, Norway lobster, sandeels and plaice are benthic spawning species within the area. Although seabed impacts will cause mortality of individuals, impacts to benthic fish species at a population level are not expected given the relatively localised nature of the activities in comparison to the surrounding seabed.

As stated in Section 2, seabed disturbance will occur from up to 30 boreholes and the seabed frame. Collectively, the boreholes and the seabed frame will impact a small area of seabed. It is expected that the disturbance will be negligible due to impacts being localised and short-lived (i.e., taking place over short period of time). Potentially affected habitats and species are anticipated to recover quickly in the area and are not expected to be impacted at a population level.

## 3.4 Seabirds

### 3.4.1 Summary of Baseline

Much of the North Sea and its surrounding coastline is an internationally important breeding and feeding habitat for seabirds.

According to the seabird density maps provided in Kober *et al.* (2010), the following species have been recorded within the proposed borehole survey area, throughout the year: Northern fulmar *Fulmarus glacialis*, sooty shearwater *Puffinus griseus*, manx shearwater *Puffinus puffinus*, European storm petrel *Hydrobates pelagicus*, Northern gannet *Morus bassanus*, pomarine skua *Stercorarius pomarinus*, Arctic skua *Stercorarius parasiticus*, great skua *Stercorarius skua*, black-legged kittiwake *Rissa tridactyla*, great black-backed gull *Larus marinus*, common gull *Larus canus*, lesser black-backed gull *Larus fuscus*, herring gull *Larus argentatus*, common guillemot *Uria aalge*, Arctic tern *Sterna paradisaea*, razorbill *Alca torda*, little auk *Alle alle* and Atlantic puffin *Fratercula arctica*.

### 3.4.2 Assessment of Potential Effects

The presence of vessel(s) in the proposed survey area has the potential to impact birds through disturbance and displacement from foraging activities. These could be through direct impact of collision and/or indirect impact through the displacement of foraging activities through species/prey disturbances.

The number of vessels in Project Morven will be limited to two during the proposed survey. In addition, operations will be very localised and of short duration, resulting in very limited displacement from foraging grounds. Impacts are therefore considered to be negligible. Potentially affected species are anticipated to recover quickly in the area and are not expected to be impacted at a population level.

## 3.5 Protected Areas

### 3.5.1 Summary of Sites

As shown in Figure 1.1, the boundary of the Project Morven is adjacent to the Firth of Forth Banks Complex NC MPA. However, the proposed borehole locations are not located within the NC MPA. Protected features and the feature type within the NC MPA are presented in Table 3-1.

*Table 3-1 Protected Features in the Firth of Forth Banks Complex NC MPA (JNCC, 2021)*

| FEATURE | TYPE OF FEATURE |
|---|---|
| Ocean quahog aggregations | Low or limited mobility species |
| Offshore subtidal sands and gravels | Habitat |
| Shelf banks and mounds | Large scale feature |
| Moraines representative of the Wee Bankie key geodiversity area | Geomorphological |

### 3.5.2 Assessment of Potential Effects

The proposed borehole survey area does not overlap with the Firth of Forth Banks Complex MPA, therefore there will be no impacts on the conservation objectives of the NC MPA from the proposed survey operations.

## 3.6 Marine Mammals

### 3.6.1 Summary of Baseline

**Cetaceans**

Eight species of cetaceans have been recorded in the waters of east Scotland (SeaWatch, 2022). According to SeaWatch Foundation, the east region of Scotland (including nearshore [within 60 km of the coast] and offshore waters) from Eyemouth on the Scottish Borders to Cape Wrath in Highland Region is moderately rich in cetacean fauna. From East Lothian to Angus, six species (a little over 21% of the 28 total UK species) are recorded regularly and are expected to be present in the survey area (SeaWatch, 2022; Hague *et al.*, 2020; Reid *et al.*, 2003; Hammond *et al.*, 2021).

The following eight cetacean species are known to frequent or seasonally visit the waters of the east coast of Scotland: Atlantic white-sided dolphin *Lagenorhynchus acutus*; harbour porpoise *Phocoena phocoena*; bottlenose dolphin *Tursiops truncatus*; white-beaked dolphin *Lagenorhynchus albirostris*; killer whale *Orcinus orca*; minke whale *Balaenoptera acutorostrata*, Risso's dolphin *Grampus griseus*; and long-finned pilot whale *Globicephala melas* (Hammond *et al.*, 2021; Hague *et al.*, 2020; SeaWatch 2022). Of these species, it is expected that Atlantic white-sided dolphin, bottlenose dolphins, harbour porpoise, killer whale, minke whale and white-beaked dolphin occur with the most frequency in the Project Morven area and its surrounding waters based on survey data and available published abundance and distribution data (Reid *et al.*, 2003; Hague *et al.*, 2020; Hammond *et al.*, 2021).

**Seals**

Two species of seals live and breed in the UK, namely the grey seal *Halichoerus grypus* and the harbour seal *Phoca vitulina* (Jones *et al.*, 2015; DECC, 2016). Both grey and harbour seals are listed under Annex II of the EU Habitats Directive and are PMFs (NatureScot, 2020).

Grey and harbour seals feed in inshore and offshore waters depending on the distribution of their prey, which changes both seasonally and yearly. Both species tend to be concentrated close to shore, particularly during the pupping and moulting season. Seal tracking studies from the Moray Firth have indicated that the foraging movements of harbour seals are generally restricted to within a 40–50 km range of their haul-out sites (Special Committee on Seals, 2020). The movements of grey seals can involve larger distances than those of the harbour seal and tracking of individual seals has shown that most foraging probably occurs within 100 km of a haul-out site although they can feed up to several hundred kilometres offshore (Special Committee on Seals, 2020).

Since the proposed borehole survey will be located offshore, it is likely that grey and harbour seals will be encountered. This is confirmed by the grey and harbour seal density maps published by the Sea Mammal Research Unit (SMRU), which are provided in the NMPi (2023). The maps report the presence of common seals as < 1 individual per 25 km$^2$ and grey seals in the area as between 1 and 5 per 25 km$^2$.

## 3.6.2 Assessment of Potential Effects

Marine mammals in the proposed survey area are highly unlikely to be affected by the sampling works directly, with the only possible indirect disturbance from the presence of the survey and PCPT vessels that will be used. Potential disturbance from the survey and PCPT vessels is only likely when it is transiting between borehole locations.

The most likely scenario in relation to the disturbance of marine mammals is that individuals will demonstrate a short-term behavioural response (i.e., avoidance) to vessel presence but will return following the completion of works. It is expected that potential disturbance is anticipated to be negligible and of no concern due to the short-term duration of the works (i.e., taking place over a short period of time) and extensive alternative habitat available for marine mammals to use.

Marine mammals may also be impacted indirectly by their prey source (such as sandeels for harbour porpoise) being potentially impacted by seabed disturbances. As stated in Section 2, seabed disturbance will occur from the boreholes and seabed frame. It is expected that the seabed disturbance, when compared to the wider available area is minimal, and therefore impacts to prey sources which could potentially indirectly impact marine mammals is negligible.

The noise generated from the drilling of boreholes and DPS will be limited and is not expected to alter background noise levels in the marine environment. An assessment of the use of USBL is provided below as this may result in noise related disturbance.

**USBL Disturbance**

An auditory threshold for disturbance of $SPL_{rms}$ of 160 db re 1µPa, as defined by the National Marine Fisheries Service (NMFS, 2018), coupled with behavioural response criteria detailed in Southall *et al.* (2007) have been adopted for the assessment of potential cetacean disturbance. This has been used in conjunction with the simple sound propagation loss model for intermediate spreading (Farcas *et al.*, 2016) to estimate the range of cetacean disturbance which may result from the use of USBL during the proposed survey activities:

$$S2=S1-15Log10(R)$$

*Where S1= SPL at source, S2 = SPL at distance R from the source, and R = range from the source in metres.*

The results are presented in Table 3-2 below which provides the estimated ranges from the USBL that cetaceans would be potentially disturbed. It was found that during USBL operations, cetaceans would not experience any disturbance beyond 1,080 m from the survey equipment. The results below are provided for a typical USBL equipment.

*Table 3-2 Radii of disturbance to cetaceans from impulsive underwater noise*

| Survey Equipment and Acoustic Details | | | Propagation Modelling | |
|---|---|---|---|---|
| System | Frequency (kHz) | SPLrms (db re 1µPa) | Disturbance Criteria SPLrms (db re 1µPa) | Estimated Disturbance Range (m)* |
| Typical USBL equipment | 20.5 – 29.5 | 206 | 160 | 1,080 |

* It should be noted that the presented calculation is a very high level calculation and does not take into consideration other important affecting factors such as frequency distribution and seabed substrate type. Both of these factors will have an effect on the attenuation of sound in the marine environment and therefore the disturbance distance presented here can be considered to be a conservative estimate.

Assuming a worst-case behavioural radius of 1,080 m, this will result in a potential worst case disturbance impact area of 3.66 $km^2$. Atlantic white-sided dolphin, bottlenose dolphins, harbour porpoise, killer whale, minke whale and white-beaked dolphin are known to frequent the Morven area.

The number of individual cetaceans in UK waters and the Management Units in the potentially affected by the proposed operations are detailed in Table 3-3.

*Table 3-3- Estimated Number of Cetaceans Experiencing Behavioural Changes Based on a use of the Kongsberg HIPAP USBL (212 m) (Hammond et al., 2021; IAMMWG, 2022, NMPi, 2023)*

| Species | SCANS-III Density (Animal) estimates per km$^2$ | Maximum number of animals predicted to be in the behavioural change impact zone at any one time (density x behavioural change area) | Management Unit (MU) / Biogeographical Population Estimate in UK waters (IAMMWG, 2022) | Percentage of reference population potentially affected in UK waters (%) | Overall Management Unit (MU) / Biogeographical Population Estimate (IAMMWG, 2022) | Percentage of reference population potentially affected in MU (%) |
|---|---|---|---|---|---|---|
| Harbour porpoise | 0.599 | 2.19 | 159,632 | 0.0014 | 346,601 | 0.006 |
| Bottlenose dolphin | 0.0298 | 0.11 | 1885 | 0.0058 | 2,022[1] | 0.0054 |
| Atlantic white-sided dolphin | 0.01 | 0.04 | 12,293 | 0.0003 | 18,128 | 0.0002 |
| Minke whale | 0.0387 | 0.14 | 10,288 | 0.0014 | 20,118 | 0.0007 |
| White-beaked dolphin | 0.243 | 0.89 | 34,025 | 0.0026 | 43,951 | 0.0020 |

*Note: Density estimates have been reported for SCANS-III Survey Block R, with the exception of killer whale where no data was available.
** Note: The area of impact is calculated based on an area of 3.66 km$^2$ from the use of a typical USBL.

The potential impacts to marine mammals via sound associated with use of the USBL have been identified and assessed. In consideration of the biogeographical population located in UK waters (Column 4 & 5) and the wider abundance of animals in the entire management unit (Column 6 & 7), the likelihood of behavioural changes based

[1] *There is no abundance estimate for bottlenose dolphin in the Coastal East Scotland Management Unit, in which the survey area is located. Abundance estimates for the nearby Greater North Sea Management Unit were used instead as they represent a worst-case for the percentage of population impacted (%).*

on numbers of mammals is <0.01% for all cetacean populations present. There will be no impacts anticipated at population level.

Additionally, the maximum number of animals predicted to be in the behavioural change impact zone is <1 for all species present, excluding the harbour porpoise. A maximum of 2.19 harbour porpoise may be present in the behavioural change zone, however, only 0014% of the UK population may be affected by the proposed operations.

## 3.7 Other Users of the Sea

### 3.7.1 Summary of Baseline

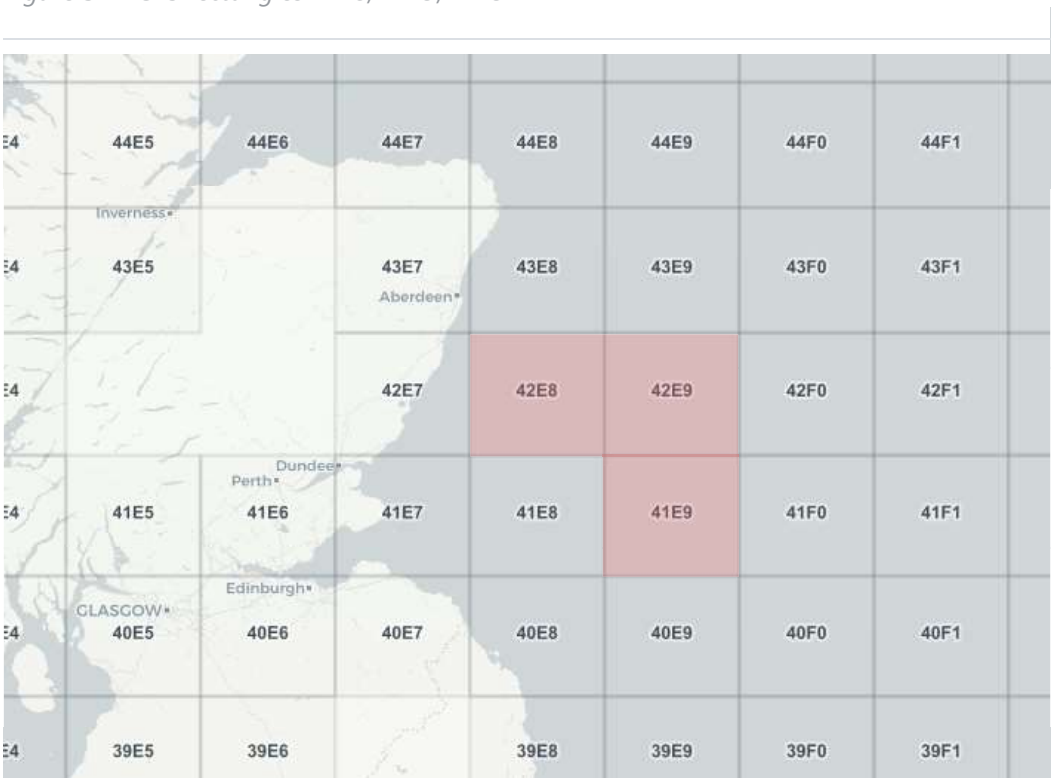
Project Morven is located in ICES rectangles 42E8, 42E9 and 41E9 (Figure 3-2). These ICES rectangles are primarily targeted for demersal and shellfish species in terms of live-weight and value in 2021. Demersal fisheries represented 79% of live-weight in ICES rectangle 42E9, while shellfish represented 99% of live-weight in ICES rectangle 42E8. In 2021, the combined value and live-weight landed for all ICES rectangles 42E8, 42E9 and 41E9 were £1,096,709 and 549 tonnes (Scottish Government, 2022).

To put this into context, a total of 538,343 tonnes with a value of £685,441,244 were landed in the UK in 2021 (Scottish Government, 2022). Therefore, in 2021, combined landings from ICES rectangles 42E8, 42E9 and 41E9 contributed to 0.10% of live-weight and 0.16% of value (Scottish Government, 2022).

The effort (in days) recorded for ICES rectangles 42E8, 42E9 and 41E9 using demersal active gear is relatively low and comparable to adjacent ICES rectangles during the 2016-2020 period (NMPi, 2023). There is no effort data for pelagic active gears or passive gears for the 2016-2020 period (NMPi, 2023). Overall, it can be considered that the area used for fishing activity is low (based on the landings) when compared to the wider area.

Furthermore, no major shipping lanes or commercial fishing areas are present in the array area and any known archaeological sites will be covered by exclusion zones and actively avoided.

*Figure 3-2 ICES rectangles 42E8, 42E9, 41E9*




## 3.7.2 Assessment of Potential Effects

When considering that the area used for fishing activity is low and shipping densities is moderate, when compared to the wider area, and that the survey and PCPT vessels will be marked with sufficient lighting to show their positions and the Kingfisher bulletin updated, it is not anticipated that there will be any significant effect on fishing activities as a result of the survey and PCPT vessels being in the area.

# 4 MITIGATION MEASURES

Certain measures are incorporated into the activity requirements as adherence to standard industry best practices or embedded mitigation which is fundamental to how the activities will be executed. Details of the embedded mitigation which bp and EnBW are committed to implementing, and hence has been considered by this Technical Note and are presented in Table 4-1.

*Table 4-1 Embedded Mitigation and Best Practice Relevant to the Proposed Activities*

| Measure | Details |
|---|---|
| All project personnel will be trained and informed of their responsibility to implement the applicable environmental and ecological mitigations. | Toolbox talks, inductions, and awareness notices will be used to disseminate this information among all relevant personnel. |
| Environmental planning | The borehole locations will limit significant impacts on sensitive environmental features, including Annex I habitats and wrecks where possible. |
| Scottish Marine Wildlife Watching Code (SMWWC) | All vessels will adhere to the provisions of the SMWWC during the proposed activities. NatureScot developed the Code as part of its duties under the Nature Conservation (Scotland) Act 2004. The Code was first published in 2006 and was revised in 2017. The code aims to minimise disturbance to marine wildlife. |
| Lighting on board installation vessels will be kept to a minimum | Lighting on-board the vessels will be kept to the minimum level required to ensure safe operations. This will minimise disturbance to seabird species. |
| Vessels will be travelling at a slow speed. | The slow speed of the survey and PCPTs vessels will minimise the risk of disturbance and injury impacts to marine species. |
| Control measures and Shipboard Oil Pollution Emergency Plans (SOPEP) will be in place and adhered to under the International Convention for the Prevention of Pollution from Ships (MARPOL) Annex I requirements for all vessels.<br><br>In the event of an accidental fuel release occurring appropriate standard practice management procedures will be implemented accordingly. | As per the MARPOL 73/78 requirement under Annex I, all ships with 400 gross tonnage and above must carry an Oil Prevention Plan as per the norms and guidelines laid down by International Maritime Organization under Marine Environmental Protection Committee (MEPC) Act.<br><br>Production of this plan will help to ensure that the potential for release of pollutants from activities is minimised. |

| Measure | Details |
|---|---|
| Vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to International Marine Organisation (IMO) MARPOL (International Convention for the Prevention of Pollution from Ships) Annex IV Prevention of Pollution from Ships standards. | Measures will be adopted to ensure that the potential for release of pollutants from installation vessels is minimised. |
| The Water Framework Directive (WFD) provides the legislative framework for the collection, transport, recovery and disposal of waste, and includes a common definition of waste.<br><br>The Environment Agency (in England and Wales) and the Scottish Environment Protection Agency (SEPA) (in Scotland) are responsible for administering and enforcing the waste management controls.<br><br>A Waste Management Strategy Plan documenting and mapping each step in the process (i.e. location and company managing waste) and define individual roles and responsibilities. | A Waste Management Plan will be developed and implemented to ensure the waste hierarchy is followed and all waste is sent onward to recycling or disposal via a licenced waste route. |
| Ballast water discharges from vessels will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (Ballast Water Management (BWM) Convention). | The BWM Convention, adopted in 2004, aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Measures will be adopted to ensure that the risk of Non-Native Marine Species (NNMS) introduction during the works is minimised. |
| Notice to Mariners (including local), Kingfisher bulletins, Radio Navigational Warnings, and/or broadcast warnings will be promulgated in advance of any proposed works. The notices will include the time and location of any work being carried out, and emergency event procedures. | Ensure navigational safety and minimise the risk and equipment snagging. |

| Measure | Details |
|---|---|
| Compliance with International Regulations for the Prevention of Collision at Sea (IRPCS) (IMO, 1972) and the International Regulations for the Safety of Life at Sea (SOLAS). | IRPCS are the international standards designed to ensure safe navigation of vessels at sea. The survey and PCPT vessels will adhere to these rules, including displaying appropriate lights and shapes.<br>SOLAS is an international maritime treaty which sets minimum safety standards in the construction, equipment and operation of merchant ships. The convention requires signatory flag states to ensure that ships flagged by them comply with at least these standards. In relation to the activities its compliance will ensure navigational safety. |
| No discharge to sea of leftover drill fluids | Leftover drill fluids will be skipped and shipped to shore for reuse and/or disposal. |

# 5 CONCLUSION

The proposed activities are due to commence by 1st June 2023 with an expected end date of 31st October 2023. However, to account for any unforeseen delays, the permit has been applied for to cover a full year until the 1st June, 2024.

Potential sensitivities include:

- The presence of biotope complex MC5 'Circalittoral Sand' and MD3 'Offshore Circalittoral Coarse Sediment';
- The presence of low to moderate densities of cetaceans (Atlantic white-sided dolphin, bottlenose dolphin, harbour porpoise, minke whale and white-beaked dolphin) and moderate to high densities of seals.
- A range of seabird species,; and
- Fish spawning and nursery grounds for a variety of commercially important fish species which include PMF species of anglerfish, blue whiting, cod, herring, ling, Norway pout, saithe, sandeels, spurdog and whiting.

Potential impacts associated with the proposed operations are not expected to be significant. The key potential impacts are summarised below.

Seabed disturbance will occur from the boreholes, CPTs and seabed frame. Maximum soil sample volume at each of the borehole locations is 2.83 $m^3$. However, this may vary depending on the drilling equipment and casings used. The borehole samples will be collected using the floating geotechnical survey vessel, whilst the PCPTs will be undertaken from a separate vessel. Both vessels will feature a dynamic positioning system. It is expected that the disturbance will be negligible due to impacts being localised and short-lived. Potentially affected habitats and species are anticipated to recover quickly in the area and are not expected to be impacted at a population level.

The sound from geotechnical survey and PCPT vessels is also not expected to pose a significant risk to cetacean species found with the area with the likelihood of cetacean moving away from the sound source for a short-duration. Sound generated by the USBL are not expected to pose a significant risk to marine mammals in the area. Sound generated by downhole geophysical logging will be highly directional and will not impact the water column.

In light of the low levels of impact predicted from these activities, and the management and control measures that will be in place, it is considered that the activities described in this Technical Note will not have a significant adverse impact on the marine environment.

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