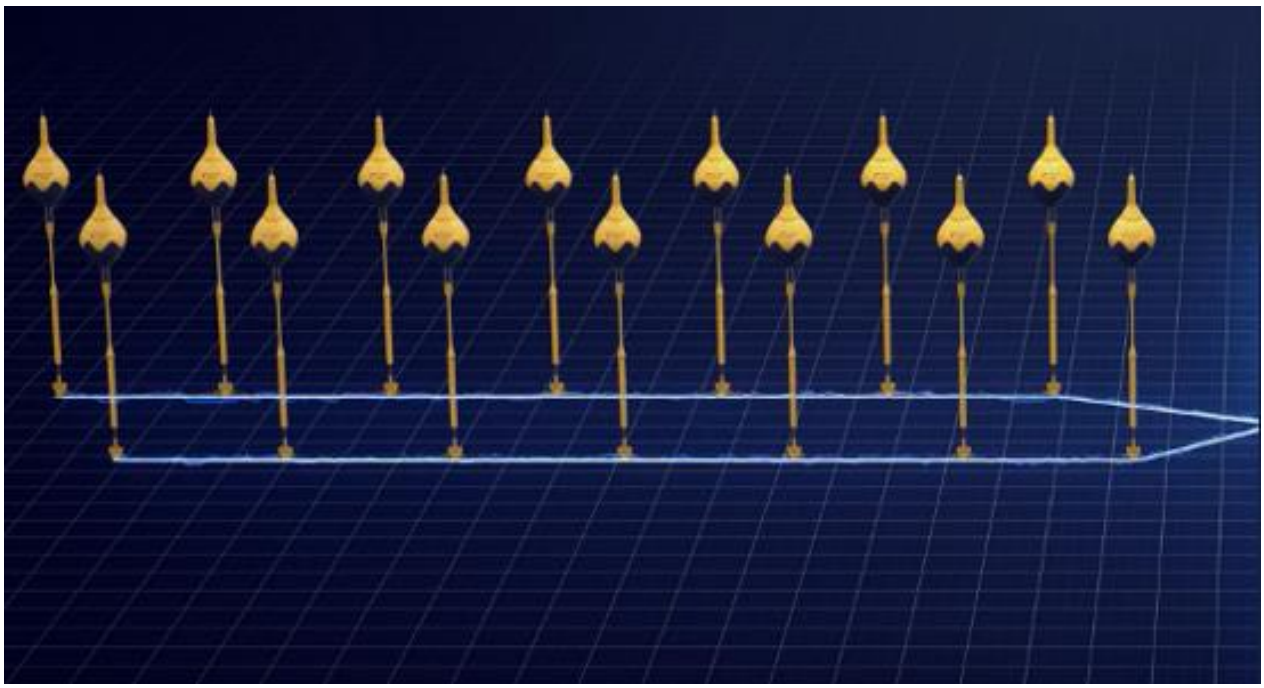
Simply Blue Energy (Orkney) Limited | CorPack wave cluster

Project-specific Environmental Monitoring Programme

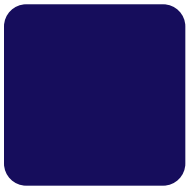
EMEC Billia Croo Wave Test Site

January 2023








Purpose

Mitigation and monitoring measures have been identified following a review of the project specific environmental impacts, taking into consideration the site-wide environmental description or environmental appraisal and associated guidance provided by EMEC. This document describes developer-identified mitigation, monitoring and management measures associated with the proposed project including any statutory reporting mechanisms. For a detailed description of the company, devices, and project, please refer to the Project Information Summary.

Document History

Revision	Date	Description	Originated by	Reviewed by	Approved by
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1 Technology

1.1 Device Overview

The CorPower WEC converts ocean waves into electricity through the rise and fall as well as the back-and-forth motion of moving water. A composite buoy, interacting with this wave motion, drives a Power Take Off (power train located inside the buoy) that converts the mechanical energy into electricity. The WEC consists of a lightweight buoy connected to the seabed through a power conversion module and a mooring system. By means of novel and patented technologies the CPO WEC moves in phase with incoming waves, amplifying the motion and power absorption, making it move in and out of the water surface.

CorPower's technology addresses the key challenges of efficient wave energy harvesting in a unique way. The device has the ability to tune and detune to the sea conditions, by such introducing a function to wave energy similar to wind turbines pitching the blades to control the driving force of the device.

Inspired by the pumping principle of the human heart, CorPower uses stored pressure to convert energy from waves in both stroke directions. The human heart uses stored hydraulic pressure to provide force for the return stroke, thereby only requiring the muscles of the heart to pump in one direction. In a similar way, CorPower WEC uses pneumatic pressure to push the buoy downwards. It mimics the energy storage aspect of the human heart whereby the upward force of a wave swell pushes the buoy upwards while the stored pneumatic pressure provides the restoring force driving the buoy downwards. This results in an equal energy production in both directions and a light-weight design with high natural frequency.

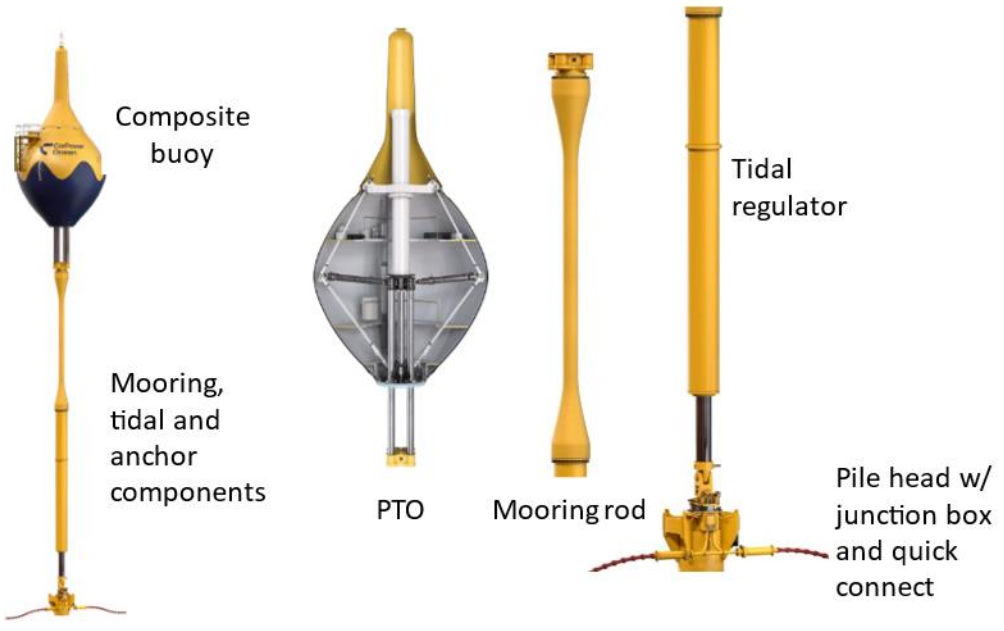

Figure 1. WEC system overview with sub-systems

The CorPower WEC (Figure 1) is a Point Absorber type of WEC rated at 350kW, with a heaving composite buoy on the ocean surface that absorbs the wave energy. The buoy is connected to the seabed using an UMACK anchor & mooring system. The WEC uses a unique phase control technology that allows the WEC to be tuned and detuned, altering the system's response to ocean conditions. In operational tuned mode, phase control makes the device oscillate in phase with incoming waves, strongly amplifying the WEC's motion and thereby the

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power capture. In storms, the detuned state makes the WEC transparent to incoming waves for enhanced survivability.

This combination allows for a large amount of energy to be harvested using a relatively small and low-cost device. Compact and lightweight devices are efficient to produce in volumes, install, operate, and maintain in modular multi-device arrays using low-cost vessels, which improves uptime, increases availability for a higher annual energy production (AEP), and significantly reduces operational costs (OPEX). Moreover, the WEC composite hulls can be produced in large numbers locally at customers' sites with a unique mobile factory concept developed and operated by CorPower, with low cost and minimum GHG emissions from transport and logistic.

The array ready device, consisting of 14 devices connected by a daisy-chain, will have an industrial design and build quality of a production machine, based on cycles of learning from the previous generation devices. The machine architecture is generally maintained from current technology generation, with innovation on sub-systems designed for reliability and optimised for volume manufacturing. It will have less parts, less complexity and deliver higher performance, reliability, and maintainability.

An overview of the WEC layout is shown in Figure 2, Figure 3 and Figure 4.

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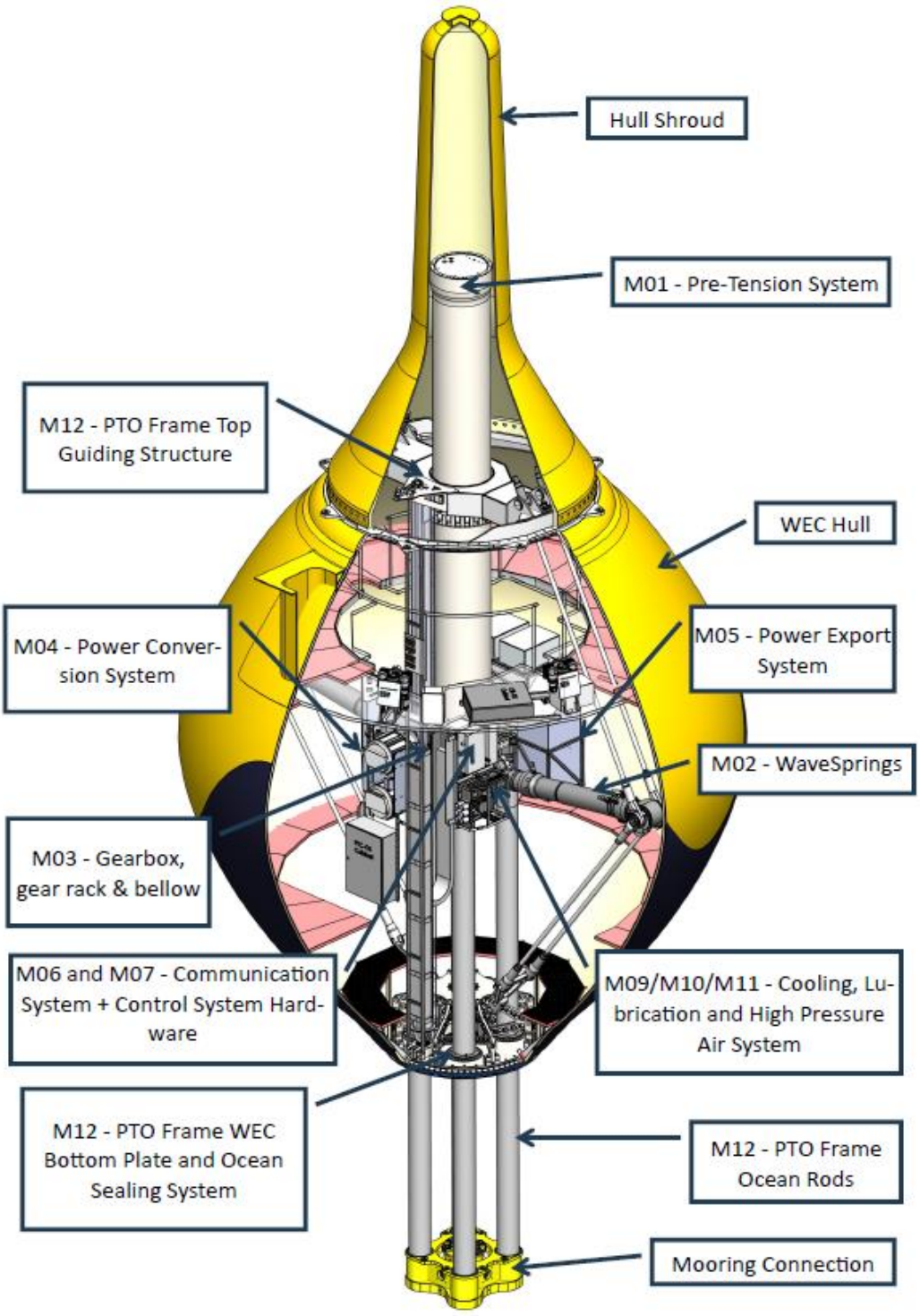

Figure 2. WEC Overview – PTO modules

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Figure 3. Corpower WEC with PTO mated in the composite hull, top shroud, and mooring rod in foreground

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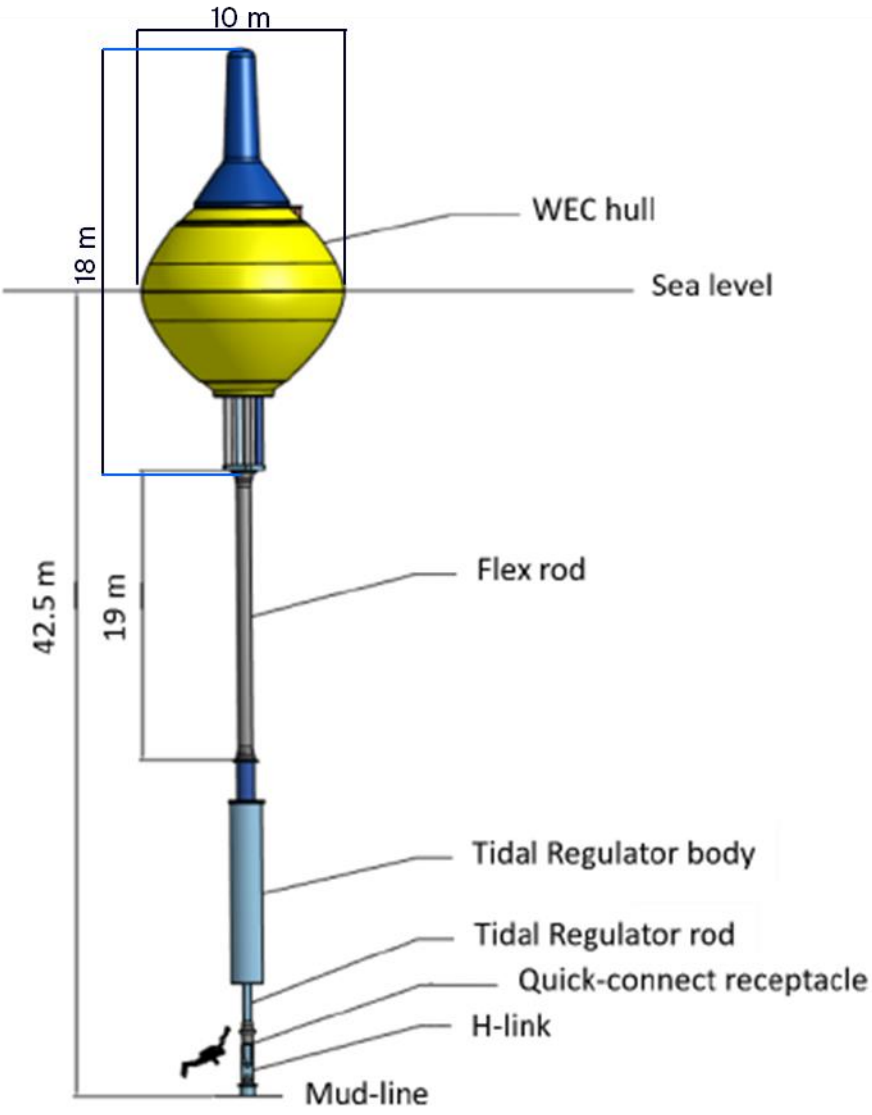

Figure 4. WEC overview - deployment

2 Environmental Monitoring

The following sections describe the potential key environmental impact(s) considered relevant to the installation, operation, maintenance and decommissioning of the CorPack wave cluster at EMEC's test site. Within the following sections is a summary of the proposed monitoring and mitigation measures relating to each potential impact pathway for the relevant project phase. Any key findings from the monitoring will be disseminated to the regulator, Marine Scotland, and appropriate advisors, e.g., Nature Scot.

2.1 Disturbance/Displacement

Increased anthropogenic activity within the marine environment can potentially cause changes in the behaviour of receptors, particularly sensitive receptors such as cetaceans, seals, basking sharks and marine birds. There is potential to cause spatial displacement of essential activities for certain species due to increased activity in the area. This is likely to be most prevalent during the installation phase when there will be marked increase in vessel traffic accessing the site. In order to determine the significance of such a potential impact, there is a

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requirement to understand the importance of the habitat and the availability of alternative habitat elsewhere. The frequency of the impact in terms of duration will also be crucial in determining the significance of the impact. As the proposed testing location at the Billia Croo test site is close to the coastline, bird species utilising coastal breeding sites may be affected by the increased vessel traffic in the area. In addition, there is the potential to affect birds foraging success or moulting, if the testing is located within a key foraging area or a moulting site. Vessels are only expected to be onsite for a maximum of 1 week in which array installation and vessel mooring removal should be completed. Given this project is an array of 14 devices, cumulative impacts of noise and presence may cause disturbance/displacement. However, the temporary nature of the increase vessel traffic onsite during installation is not expected to cause any significant impacts to seals, cetaceans, basking sharks and marine birds in the vicinity of the Billia Croo scale test site. Similar disturbance effects due to increased vessel traffic are expected on the decommissioning of the devices. This project is expected to run for 5 years which may cause a longer-term effect on receptors in terms of presence during the operational period and increased number of maintenance activities, however frequency of maintenance will not increase. Further detail on monitoring efforts is provided below in Section 4.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within disturbance/ displacement.

Table 1. Proposed monitoring and mitigation measures relevant to the impact pathway disturbance/displacement

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Installation			
Vessel activity – noise and presence may cause minor disturbance/displacement (including when transiting to and from site)	Cetaceans, seals, basking sharks, seabirds	**Mitigation**: Comply with the Scottish Marine Wildlife Watching Code (SMWWC), including the following measures: • Steady course and speed throughout operation. • Reduction of speed upon sighting of receptor. • Minimum approach distances will be adhered to. • Sudden changes in speed, direction and engine noise will be avoided. • Vessel will maintain at least 50m distance from coast during seabird breeding season.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.

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Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
		Vessels will only be onsite for the minimum period of time required.	
Potential Installation of array and anchors – noise and presence may cause minor disturbance/displacement	Cetaceans, seals, basking sharks	**Mitigation**: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.
Operation			
Presence of the array for 5 years has the potential to cause disturbance	Cetaceans, seals, basking sharks	**Monitoring:** Should funding become available, monitoring will be considered using sensors and cameras. If significant funding becomes available, then there will be opportunities for land or boat-based surveys	A report will be produced if the data collection is conducted
Decommissioning			
Vessel activity – noise and presence may cause minor disturbance/displacement (including when transiting to and from site)	Cetaceans, seals, basking sharks, seabirds	**Mitigation**: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.
Potential installation of vessel mooring or dynamic positioning (DP) – noise and presence may cause minor disturbance/displacement	Cetaceans, seals, basking sharks	**Mitigation**: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.

2.2 Acoustic impact

Noise disturbance can occur from the presence of vessels, drilling activities, anchoring, and survey activities. The creation of noise must be placed in the context of the existing environment, as other anthropogenic sources of marine noise may already be present within the area and mask the impact of any additional acoustic outputs. It is unlikely acute effects such as non-auditory/auditory tissue damage would be experienced as a consequence of the acoustic outputs from this project but behavioural effects due to disturbance are possible.

Noise disturbance effects may cause mobile species, such as cetaceans, seals and fish to move away from the immediate proximity of the installation site over the short term, but the impact is likely to be highly localised and temporary. Currently there is little known regarding importance of hearing underwater and hearing thresholds for diving birds but there is the

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potential for it to cause displacement, avoidance, reduction in foraging success or it may have no effect.

During anchor installation and decommissioning, it is expected that the vibro-hammer will cause minor acoustic impact to receptors. It is anticipated that the installation operation of the array will be completed in as short a timescale as possible, therefore, it is not expected that any significant effects to marine mammals, fish or marine birds will result from the installation phase. The same is true for maintenance and decommissioning operations.

As part of the Billia Croo section 36 conditions, EMEC will develop an Acoustic Monitoring Plan to be submitted to and approved by Marine Scotland. Any protocols outlined in this plan will be adhered to by the developer. This will be confirmed with Marine Scotland at least three months before any deployment.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within acoustic impact.

Table 2. Proposed monitoring and mitigation measures relevant to the impact pathway acoustic impact

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Installation			
Vessel activity – noise from increased activity will cause minor acoustic impact	Cetaceans, Seals, Basking Sharks	**Mitigation**: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to. **Monitoring:** Potentially monitoring noise using static and drifting passive acoustic recorders if funding is available.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper. A report will be produced if the data collection is conducted
Operation			
Noise from CorPack wave cluster generating may cause minor acoustic impact	Cetaceans, Seals, Basking Sharks	**Monitoring:** Potentially monitoring noise using static and drifting passive acoustic recorders if funding is available.	A report will be produced if the data collection is conducted
Decommissioning			
Vessel activity – noise from increased activity will cause minor acoustic impact	Cetaceans, Seals, Basking Sharks	**Mitigation**: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.

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2.3 Collision and Entanglement Risk

It is unknown whether the potential exists for cetaceans, seals and basking shark to become entangled in mooring/wire lines of the size and dimensions required to tow the devices or moor the multicat vessels that will potentially be used during this operation. Dynamic Position (DP) vessels may also be used for the installation whereby no vessel mooring lines will be present. Entangled animals may drown or starve because they are restricted by mooring lines. Wire lines will be used to install the array which in themselves could present an entanglement risk. It is assumed the mooring/wire lines used within this project will not present a risk to diving seabirds. Marine mammals and basking sharks may suffer physical trauma and infections from a striking event involving vessels used during installation and decommissioning. In addition, entangled animals may also be unable to avoid vessels like they normally would, thus increasing the risk of collision.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within collision and entanglement risk.

Table 3. Proposed monitoring and mitigation measures relevant to the impact pathway collision and entanglement risk

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Installation and decommissioning			
Vessel collision with large marine organisms	Cetaceans, Seals, Basking Sharks	**Mitigation**: The Scottish Marine Wildlife Watching Code (SMWWC) will be adhered to.	Any non-compliance with the SMWWC will be reported to the regulator as soon as notified by the vessel skipper.
Entanglement of large marine organisms in temporary boat moorings	Cetaceans, Seals, Basking Sharks	**Mitigation**: Mooring lines will be kept onsite for as short a period as possible.	Any events will be reported to the regulator as soon as possible on return to shore.
Entanglement with array tow lines	Cetaceans, Seals, Basking Sharks	**Monitoring:** Potential for sensors, or cameras depending on funding available. **Mitigation:** Winching process is slow and infrequent, lines primarily taut.	Any events will be reported to the regulator as soon as possible on return to shore.

2.4 Biofouling and non-native species (NNS) introduction

Biofouling is the settlement of biological organisms on man-made structures. Fouling is often a gradual accumulation of organisms which develops over time. Biofouling may consist of microorganism such as bacteria or protozoa or macro-organisms such as barnacles or seaweed. Once installed, the CorPack wave cluster devices, and associated anchors will be deployed onsite for an extended period of time. This period is expected to provide fouling species an opportunity to settle and grow to maturity. The spread of non-native organisms can occur through a variety of means including shipping, transport of fish or shellfish; scientific

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research and public aquaria. These invasive non-native species can threaten marine diversity. Various guidelines and standards have been referred to in developing the proposed mitigation and monitoring measures (IMO, 2011). It is anticipated that a certain level of biofouling will accumulate, although it is not expected to pose a significant risk to introducing non-native species as movements will be limited to UK waters only. However, the introduction of hard substrate into the marine environment may also act as a 'stepping-stone' for non-native species. A device may act as locations for non-native species to grow in the area and thus provide a stepping-stone for colonization. Detrimental impacts of non-native species on native biota can occur through competition, predation, herbivory, habitat alteration and disease.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within biofouling and the introduction/transfer of non-native species.

Table 4. Proposed monitoring and mitigation measures relevant to the impact pathway biofouling and introduction of non-native species

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Installation			
Introduction of non-native species (via vessel or equipment)	Benthic species and habitats, and benthic fish and shellfish	**Mitigation**: Where possible & practical local vessel and equipment will be used, reducing the potential for introduction of NNS. Compliance with good practice measures.	Any deviance from the good practice measures will be reported.
Operation			
Accumulation of biofouling on devices and anchors may alter local ecosystem	Benthic species and habitats, and benthic fish and shellfish	**Mitigation:** Fouling resistant paint may be used (e.g., silicone based) but toxic (e.g., copper based) paint is not anticipated. The devices will be cleaned periodically.	N/A
Decommissioning			
Introduction of non-native species (via vessel or equipment)	Benthic species and habitats, and benthic fish and shellfish	**Mitigation**: Where possible & practical local vessel and equipment will be used, reducing the potential for introduction of NNS. Compliance with good practice measures.	Any deviance from the good practice measures will be reported.

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Good practice measures refer to the '2011 guidelines for the control and management of ships biofouling to minimise the transfer of invasive aquatic species' (International Maritime Organisation).

2.5 Habitat Creation

The installation and physical presence of the device and associated anchor will inherently result in direct habitat loss. However, colonisation of the introduced structures may have the potential to function as artificial reefs or fish aggregating devices. The increase in the local reef extent may be limited due to the size and number of the devices therefore diminishing the significance of this impact. This artificial substrate could alter the nature and composition of the species present and may enable non-native species to colonise and potentially spread to other areas.

Cetacean, seal and seabird distribution may be influenced by prey distribution and associated prey habitat. The physical presence of the CorPack wave cluster may offer enhanced foraging efficiency for some species.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within habitat creation.

Table 5. Proposed monitoring and mitigation measures relevant to the impact pathway habitat creation

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Operation			
Fish aggregation device (FAD) effect and colonisation of fouling organisms due to introduction of hard structure (Devices and anchors)	Benthic species and habitats, and fish and shellfish	No significant impacts are expected; therefore, no specific monitoring measures are proposed.	N/A
Creation of habitat around installed infrastructure	Benthic species and habitats, and fish and shellfish	**Monitoring**: There is a likelihood of reef effects around the installed anchors. There is no proposed monitoring measure however, when the opportunity arises, any video footage of the moorings will be analysed to quantify the level of reefing taking place.	Findings from analysis will be reported to the regulator as and when available.

2.6 Seabed Clearance

During the installation phase, the deployment of potential vessel moorings and device anchors will cause a loss of benthic habitat. Each anchor is expected to have a circumference of 3.7m and will be vibrated 18m into the seabed. Small amounts of lost habitat may diminish

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populations of species that are recorded as rare. However, vessel moorings and device anchors tend to have a small footprint and are temporary deposits.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway within seabed clearance.

Table 6. Proposed monitoring and mitigation measures relevant to the impact pathway seabed clearance

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
All project phases			
Seabed clearance and habitat loss/disturbance from installation and removal of equipment	Benthic species and habitats, and fish and shellfish	**Mitigation:** Drop-camera will be used during anchor installation and if any sensitive receptors are identified during installation, then these areas will be avoided through micro-siting of the anchors on the seabed.	N/A
Installation of anchors causes damage to cultural heritage or archaeological objects within the site.	Cultural heritage and archaeological objects	**Mitigation:** The appropriate consultation with HES will be undertaken if cultural heritage or archaeological objects are found during this operation.	The regulator and HES will be consulted if any cultural or archaeological objects are found during the operation.

2.7 Discharges to the Marine Environment

Benthic species may be exposed to materials such as paints, hydraulic fuels and antifouling compounds originating directly from the devices. Accidental spillages from installation or maintenance vessels could also occur. Spillages pose a risk to marine mammals, fish, seabirds and benthic communities and can cause direct effects at the time of the spill or can result in chemical accumulation in body tissues leading to lagged effects on health and breeding success.

The following table summarises the proposed monitoring and mitigation measures for the relevant project phase relating to each potential impact pathway for discharges to the marine environment.

Table 7. Proposed monitoring and mitigation measures relevant to the impact pathway discharges to the marine environment

Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
All project phases			

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Relevant Project Phase	Impact Pathway	Receptor	Proposed Mitigation/Monitoring Measure
Leakage of fuel or chemicals from vessels involved with installation, maintenance and decommissioning can enter the food-web at any trophic level	Potentially whole local ecosystem	**Mitigation:** Vessel crews should follow standard procedures to avoid fuel and chemical spills. Suitable spill kits should be onboard all vessels involved in the project.	Any incidents will be reported to the regulator as soon as possible.
Operation			
Corrosion of materials used to construct the devices and anchors introduce toxins to environment and disrupt ecosystem dynamics	Potentially whole local ecosystem	**Mitigation:** N/A	N/A

3 Cultural Heritage Impacts

3.1 Prehistoric sites

Inferences can be made on the potential for the survival of prehistoric deposits in the area of Billia Croo from coring, bathymetric, side scan sonar (SSS) and sub-bottom profile (SBP) data obtained by various surveys in and close to the test site and observations made during numerous diving operations at various devices and in the general area by SULA Diving.

SSS surveys combined with data from SBP surveys and other studies indicate that there is a transition from exposed bedrock (inshore) to mobile sandy sediments around the 20-25 m contour. Surficial deposits in the area of the EMEC test site are predominantly mobile or featureless sand interspersed with intermittent glacial erratic's and patches of coarser sediment interpreted as glacial till deposits since they tend to correlate with areas of deeper sediment deposition and a change in seabed topography. Where present, deposits appear to be 1-10 m thick, overlying bedrock.

In summary, in the offshore lease area, the extension area, and the route to shore at Billia Croo (inshore lease area), the potential for the survival of prehistoric deposits is negligible-low, especially because most of the site is exposed bedrock, or mobile sediments comprising sandy gravels and gravelly sands.

3.2 Shipwrecks, aircraft, and obstructions

No marine cultural heritage statutory designations have been identified in the Billia Croo test site area. There are no UK Hydrographic Office (UKHO) reports showing the existence of any wrecks within the area and none shown on the relevant UKHO charts.

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A total of fifteen shipwrecks were identified for this area. No exact wreck positions are known, but the records must be taken as indicative of the potential for wrecks (and artefacts) having been present in the area at some point in time. Considering the nature of the shoreline, the weather and sea conditions experienced along this coast, it is unlikely that the vessels remain intact and in the reported area of foundering, or that any remains survive. The majority of vessels lost in the area were wooden sailing ships stranded in the shallows and many are listed as being broken up and salvaged at the time. Those that came ashore in heavy weather were inevitably broken up by the sea on the rock-strewn coastline. Similarly, later vessels of iron construction were the result of stranding's and, given the exposed rocky nature of the coastline and environmental conditions in the area, are not likely to remain intact unless buried in sediment

Multi-beam bathymetry and side scan sonar tend not to be able to distinguish between the wreck and the geology of the seabed. Magnetometry is the only method of determining if a wreck may be present. Given that the area is mostly exposed bedrock and any sediment being shallow and mobile, it is unlikely that much, if anything, survives and nothing has been observed during SULA Diving investigations in the area.

4 Environmental monitoring

CorPower Ocean are currently working on their Hiwave-5 deployment in Portugal (2022-2024). During this project they envisage carrying out more than 20 environmental monitoring campaigns to assess the effects of their WECs to the marine environment and ecosystem. These campaigns will include cetacean acoustics and visual observations, underwater noise monitoring using hydrophones and assessing colonisation of equipment. Once data is successfully collected CorPower Ocean will be able to share this data with the necessary stakeholders such as NatureScot and Marine Scotland Science. Should funding be available, similar campaigns could be conducted at Billia Croo during the CorPack wave cluster deployment.

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The European Marine Energy Centre Limited
The Charles Clouston Building, ORIC, Back Road, Stromness, ORKNEY, KW16 3AW
Tel: 01856 852060
Email: info@emec.org.uk **Web:** www.emec.org.uk
Registered in Scotland no.SC249331 VAT Registration Number: GB 828 8550 90

MANAGEMENT SYSTEM CERTIFICATION
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