

## AnC Re-application - Environmental Responsibilities

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## AnC Re-application - Environmental Responsibilities

### 01 Introduction

Samudra Oceans Limited (Samudra) have taken over the Crown Estate Scotland Lease and purchased the Algae license and in water equipment for the seaweed farm near Oban named Aird na Cuile previously owned by New Wave Foods. The seaweed farm site was selected for its suitability to cultivate seaweed and for local pier and harbour access and has been operational for 6 years. The existing marine license - MS license - 06704/18/01 is due to expire on 01/10/2024. Argyll Aquaculture, who were authors of the original license have been asked to act as Agent for Samudra and write this Re-Application.

This document is more specifically aimed at Nature Scot's needs and has been heavily influenced by direct guidance from them during other seaweed consenting processes. It attempts to set down Samudra's understanding of the impacts their development will have on the site of the seaweed farm, the transit routes and shore base area and the wider environment.

### 02 Farming species choice/Seeding Process

Samudra intend to cultivate several native species. At this time, the three main seaweed cultivation species will be Atlantic wakame (*alaria esculenta*), Sugar Kelp (*saccharina latissima*) and Oar Weed (*laminaria digitata*). These large brown seaweeds or "kelps" are found on lower littoral and sub-littoral rocks exposed to strong wave action upon the local coast. Other large brown seaweeds (or Kelps) may also be trialled to test for natural self-seeding of lines and for their chemical and nutrient content.

The Kelps have similar seeding seasons and scatter seeds into the water in late November through to early January. Fruiting bodies develop on varying parts of the seaweeds, near the base of the plants in the case of *alaria*, or along the fronds in the other species. Fertile seeded stock will be collected from local shore sites and will be cultured onto growing medium at a commercial hatchery.

Dulse (*palmaria palmata*) and Pepper Dulse (*osmundea pinnatifida*) are valuable, small red seaweeds and Sea Lettuce (*ulva lactuca*) a valuable, small green seaweed that are native to the area. At the moment they are mostly hand harvested but the technology to cultivate them is under development. Samudra are including these species in their application in anticipation of the technology to viably farm them becoming available at a future date.

The volumes of seeding plants required to be collected are very small, a standard bucket of fertile seaweed can nurture 20km worth of seeded farm growing line which can produce over 150 tonnes of mature seaweeds.

All the species to be farmed are native and grow abundantly locally but inhabit the very lowest of the shoreline only exposed on low spring tides. This does not lend them to large scale shore harvesting by hand. So, cultivation is seen as a necessary method to grow these seaweeds at scale. There are no chemical additions or treatments used for the seaweed growing process.



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There are no feeds introduced to the water. The ropes used for growing are removed at the same time as the seaweed is harvested. This form of sea farming has a very light impact on the environment, compared to that of some other aquaculture means, with the spatial impact the main theme.

The existing consented seaweed farm site was selected for its wind/wave exposure range of moderate to rough (depending on wind direction). The more exposed a farm is to wind/waves, the more suitable the farm will be for the seeding of alaria while lower wind/wave exposure will make the farm more suitable for sugar kelp farming. The true nature of the sea farm site will be discovered through trial and error over future harvest years.

Initially, Samudra envisage small vessels (probably a 6m vessel and an 11m vessel) being used for seeding, maintenance, and harvesting which work best in short windows of weather opportunity. This site was selected to strike a balance between anticipated yield, ease of cultivation, and proximity to landing points to give the best possible chance of success.

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### 03 Existing Aird na Cuile Seaweed Farm

The embayment of Aird na Cuile point sits at the south end of the Sound of Kerrera. The site is open to the sea to southwest and sheltered under steeply rising sea cliffs to the north and east and a rocky coastline of islands to the south. The farm site licensed in 2018 by Argyll Aquaculture, for New Wave Foods, stretches from Aird na Cuile point down to the open entrance to seaward of Loch Feochan. The farm site is 8km south of the major port of Oban and has routes to smaller shorebases to the east and south (Fig 1).

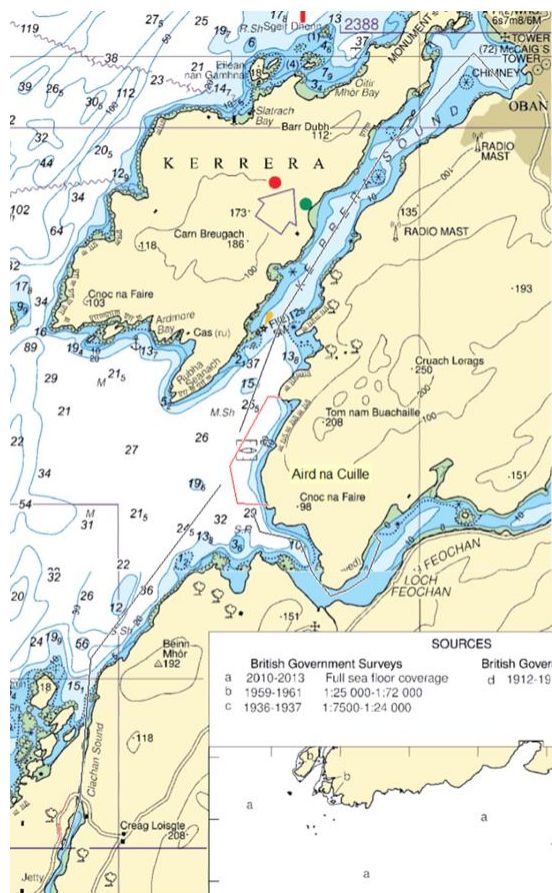


Fig 1 - Transit Routes (black) – Oban (8km), Loch Feochan (3km), Clachan Seil (6km) to farm (red). Samudra’s planned operations are all likely to be conducted in daylight hours.

At this time the existing consented area of the seaweed farm site has 2 small structures in the water. These were deployed as test structures to study the viability of the site for seaweed cultivation and the farming methods suited to the site itself. These structures are a 50m x 50 grid system and a 200m longline system. They currently have a capacity to take 1.2km of Growing line, with an offtake capacity of 12 tonnes per year.

The original Lease Option Agreement (LOA) consent area secured from Crown Estate Scotland (CES) will not be exceeded by any of the works undertaken at the site. The proposed farm structures will have anchors set in a similar way to ensure they stay clear of rocky reefs and intertidal rock areas which hold many important sea-life habitats.



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In 2018, Northern Lighthouse Board set the navigational buoyage for the farm site for the outer corners of the sea farm area to be delimited by the conventional system for marking aquaculture sites of 3 x Special Mark buoys.

These large, yellow-coloured floating buoys are each marked by a top piece with a yellow St Andrews Cross. A solar panel charged, battery powered light unit on each flash yellow at night. These will allow local and visitor marine users to keep a safe distance from surface and submerged structures within the consented area. The light pattern is a conventional Yellow Flash every 5 seconds (Y Fl 5s).

### 04 Future Farming Development

Samudra wish to scale up the farming with plans similar to those made by the previous owner. Using the already consented farm area economically, the site could hold up to 9 grids. Local seabed topography and other practical considerations at the sea farm site may reduce the number of Grid Units and therefore the length of growing line deployed. A contingency of possible reduction in growing line capacity will be applied in financial modelling.

Certainly, any scaling up will be phased over several seasons. With up to 9 of 200m x 100m grids theoretically increasing the growing capacity take 36km of Growing line, with an offtake capacity of over 300 tonnes per year.

'Grid systems' consist of a 200m x 100m grid of subsurface ropes and anchors across which 100m long Growing Lines are set. Growing Lines can be set out as low as 2m spacing, but in active sea conditions this can allow lines to interact and twist. Our intention will be to initially trial growing lines at 5m average spacing with new technological improvements to avoid interaction of lines. From there, we will incrementally test different spacing distances to realise optimum efficiency. We estimate that by using average 5m spacing each grid unit can take 40 lines (4,000m of growing line per grid unit). To allow for anchoring and vessel space between grids each 200m x 100m grid unit is given 300m x 150m of clearance space (Fig 2).

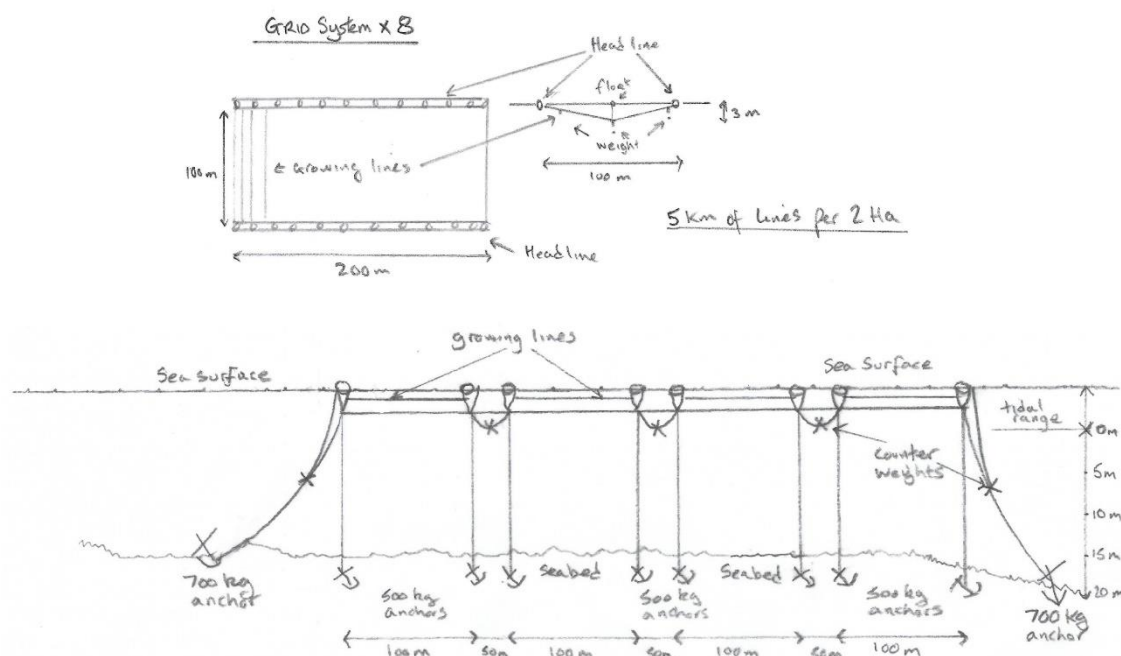


Fig 2 – Grid system seaweed farm layout.

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From our desktop studies and experience we believe that the grid systems (with technological enhancements) produce superior growing line length for the sea area they take up when compared to longline systems.

Each seaweed Growing Line is 100m long and with an 8.6kg average growth per linear metre (average between species and over growing peak) each Growing Line will hold and expected yield of 860kg of seaweed by harvest time. Each seaweed grid holds 40 x 100m of Growing Lines, so each Grid could hold 34.4 tonnes of seaweed by mid to late April.

The farm design is sufficiently robust to withstand the most extreme weather conditions to be found at site and be well within the tolerances of the structures. Factors tested are the worst case scenarios (i.e. the effect of the worst winter storms impacting the farm when it is most heavily laden with seaweed biomass in late spring).

The design has already been used and proven in licensed farms on the west coast (e.g. South West Mull and Iona Development, Mull). This farm is now completed its third winter without issues. The anchoring system used will be robust to ensure farm's stability but use the minimum amount of infrastructure possible to reduce the footprint of the site and reduce seabed impact.



### 05 Site Designations

Integral to the original consenting process in 2018 was the scrutiny of Site Designations by statutory consultees Nature Scot and the Scottish Environment Protection Agency (SEPA) during the Marine Scotland Pre Application Consultation (PAC) process and Licence Application process. This was completed without concern from any of the above Regulators, but Samudra have undertaken full Due Diligence for their operations.

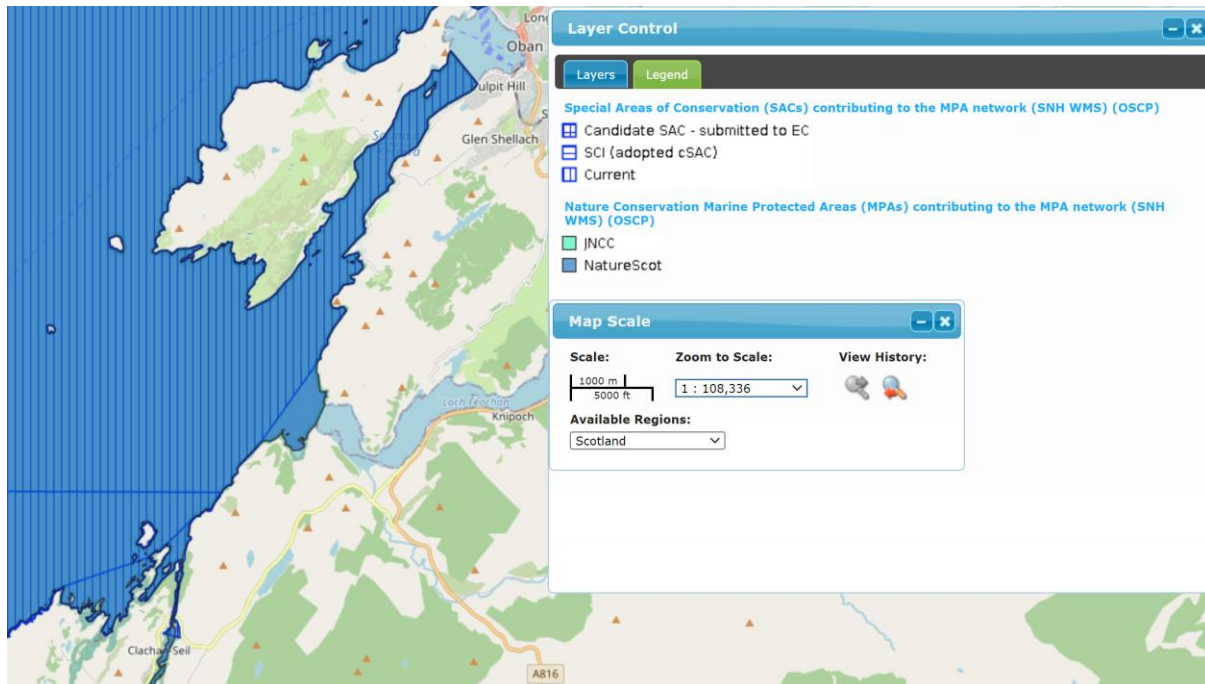


Fig 3 – Site Designations

#### 05.01 Designations (Fig 3)

The existing consented area of the farm site, sits within the Loch Sunart to the Sound of Jura – Marine Protected Area (MPA) <https://sitelink.nature.scot/site/10418> which takes much of the sea area inside the Inner Hebrides. This MPA is set up for the protection of 'Flapper skate' (*dipturus intermedius*), which are heavily affected by mobile fishing activity, both as a bycatch of commercial fisheries and destruction of their egg laying sites.

The existing consented area of the seaweed farm site sits within the Inner Hebrides and the Minches Special Area of Conservation (SAC) <https://sitelink.nature.scot/site/10508> which encompasses the greater proportion of the whole coast. This SAC is set up for the protection of 'Harbour porpoise' (*phocoena phocoena*), which frequent the west coast of Scotland.

The [Habitat classification by EUNIS 2019](#) for the existing consented area of the seaweed farm site is given as High Energy, Shallow Circalittoral Seabed, A5.3 Circalittoral mud.



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### 05.02 Underwater Archaeology

The location of the seaweed farm site is not located on / near a Scheduled Monument - including protected wrecks (HES WMS) (OSCP) according to NMPI data

### 05.03 SEPA Management Controls

The wider sea area around Oban falls under Marine Directorate - Disease Management Area 15b which covers most of the inner Loch Linne, Sound of Mull and Sunart area. The scheme in place for disease/lice control and for nutrification control.

### 05.04 Other Marine users

Within 2km to the north of the existing consented area of the seaweed farm site is another seaweed research farm, "Cutter Rock" managed by the Scottish Association for Marine Science (SAMS). The next nearest aquaculture site is a finfish farm some 8km away to the northwest, active for Atlantic Salmon farming, operated by Scottish Sea Farms (SSF).

A small local creel fleet work this sea area from the harbour of Oban and across from Craignure on Mull. Samudra intend to partner with local vessel owners to complement their work.

The harbour of Oban attracts hundreds of small to very large ships, bringing cargo and tourists to the port. Oban is one of busiest ferry ports in the UK and is the transit hub to the Inner and Outer Hebrides beyond. The Oban/Lorn area is well used by yacht and sea kayakers. This is mostly seasonal as a summer destination.

The existing consented area of the seaweed farm site is well marked and out of the main channel of transit into the Sound of Kerrera. It is marked in accordance with normal navigational practice for aquaculture sites, with 3 yellow Special Marks. A full document "AnC Re-application - Navigational Risk Assessment, MEAC & Decom Plan v1.1" accompanies this one and lays out the marine safety side of the Re-application proposal.

Also see bellow in - 06 Visual Impact.



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### 06 Visual Impact

The existing consented area of the seaweed farm site is located offshore in an embayment, south of Aird na Cuile point. This operational seaweed farm site is located 100m west of the nearest shoreline (Mean Low Water Spring, MLWS) below the steeply stepped slopes of the rocky coastline.

There are no national landscape designations which cover the site or surrounding area. There are no nearby residential properties, other habitation, core paths or roadways overlooking the seaweed farm site. The closest habitation locations are:

- the closest residential receptor is Gallanach House, a private house physically hidden from the farm site by over 1km of rocky hills.
- The Gallanach Road which runs from the house for 4km to Oban. There are houses and businesses located c. 2.5km to the north of the farm site and a ferry facility on the Gallanach road side. All are hidden from the farm site itself.

From a marine based vantage point, a seaweed farm can be difficult to make out from the land background and the dark colours of the water itself. Seaweed Farms have a low profile, with the visible surface equipment (when fully deployed) being a series of 118 parallel mussel farm style headlines, each 200m long, with 150l black buoys every 10m. This permanent structure of the farm blends in with the dark background ensuring visual impact is kept to a minimum.

The seabed anchoring system sinks well into the soft benthic muds and are kept well away from any rocky reef systems nearer the shore. The sub surface structure of the farm grid system will be constructed of heavy duty webbing slings to minimise the use of steel chains (which wear faster and pollute the area with rust). There are no rocky peaks within the farm footprint. Seasonal (Oct to May) seeded Growing lines will be deployed and held under tension subsurface between 1.5m and 3m.

The most visible indicator of the farm will be Special Mark buoys placed to clearly mark the outer limits of the site for mariners. No other arrangement for lights has been recommended by NLB and MCGA during this application process and the above forms the ongoing license conditions of the site. As with other similar aquaculture sites, the specific details of these special marks are given by MS-LOT/NLB as;

- a) The site is currently marked with 2 lit yellow buoys fitted with yellow 'X' topmarks (this will increase to 3 when fully developed).
- b) Each light displays a character of flash one yellow every five seconds (Fl Y 5s) with a nominal range of 2 nautical miles and is installed above the 'X' topmark.
- c) The buoys are approximately 1 metre in diameter at the waterline with the focal plane of the light 2 metres above that level, the 'X' topmark is greater than or equal to 50cm length by 7.5cm width.



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### 07 Wildlife Considerations and the environment

#### 07.01 Introduction

Seaweed cultivation is a relatively benign form of aquaculture. The plants need no more than sunlight and ocean nutrients to grow. There are no feed additives or waste from the plants.

The spatial aspect of seaweed farming is the most obvious issue. As plants need sunlight, we must lay them out horizontally to receive the optimum amount of sunlight. The lines are also spaced out to allow water flow for nutrients to reach the plants. This requires more surface area than other forms of aquaculture where animals are fed artificially in deep cages or hung into the depths to catch food particles flowing through the site. Whilst the area required for seaweed farms is large when compared to other aquaculture sites, the impacts are considered low or 'not significant' given lack of waste the seaweed farms produce.

The surface area needed to produce economically viable amounts of seaweed, can cause concerns over competition for space with wildlife. Samudra are aware of the potential for impact on wildlife, most notably seabirds, seals and cetaceans which the area has varying designations for. From observations at other seaweed farms and sea farm sites, it has been noted that wildlife can become very tolerant of low level human activity especially when kept out of sensitive breeding times and/or kept at a respectful distance.

To address potential operational impacts, Samudra are committed to site specific mitigation to minimise impacts (site location, timing of operations, operational management and training) and a wildlife monitoring programme. This monitoring can be provided to Marine Scotland and NatureScot and it is hoped will also will support other future seaweed farm applications.

#### 07.02 Bird and Pinniped Entanglement

The Samudra site will use no nets in the cultivation process for crop protection (e.g. as netting against eider ducks on mussel farms or anti predator netting against seals on fin fish farms). These nets are known to cause entanglement of diving birds and seals.

#### 07.03 Harbour Seal (*phoca vitulina*) Haul out

Harbour seals are a European Protected Species (EPS) and as such have legal protection from harm, disturbance and habitat interference. Harbour seals are regularly seen in the area and there is a small colony often seen basking on the Cutter Rocks, 1km to the north of the site.

Specific breeding times of the 'Harbour Seal' (*phoca vitulina*) are early summer (June to July). During this time nursing females and pups stay ashore for several weeks. They also spend a lot of time ashore during their annual moult in August. Sea Mammal Research Unit (SMRU)



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have advised that moulting continues to at least early-September in this area. The adults and pups disperse into the water once the moult is completed and pups are weaned.

As mitigation to further avoid seal disturbance, all of Samudra's activities will be well outwith the 100m distance that "[The Scottish Marine Wildlife Watching Code](#)" recommend as safe to avoid disturbance should you encounter a seal or other wildlife at sea. Further details have also been taken from "[A Guide to Best Practice for Watching Marine Wildlife](#)". Transit routes to and from the site follow safe distances past these islands and rocks and form the safe passage routes of the local Harbour Authority of Oban, 8km to the north.

Samudra vessels and crew will be carefully trained on how to interact with wildlife. Many Samudra vessel staff will be local to the area and are already involved in fishing or marine wildlife tours and therefore be fully aware of the value of an undisturbed wild environment and the legal and moral obligations of limited interactions with wildlife.

The peak times for seaweed operational activity at the existing farm site is October/November for Growing Line deployment and late March through early May for harvesting (timing will be subject to agreement with statutory consultees to avoid the most sensitive timescales locally).

During the specific breeding times of the harbour seal, (early summer - June to July) the existing consented seaweed farm will essentially lay fallow with the bare subsurface structure only. The only interaction with the sea farm site during this period will be statutory weekly visits by local vessels to ensure the site structural integrity.

Samudra vessels will never intentionally steer toward seals seen in the water. Vessels will slow or where safe to do so, steer to avoid seals seen in the water. Additional advice from NS around slowing and stopping vessels to prevent disturbance has been given and will be adhered to.

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### 07.04 Cetacean Entanglement

Whilst there have been no reported cases of entanglement of cetaceans in kelp longline farming (Kraus et al., 2005<sup>1</sup>; NOAA, 2016<sup>2</sup>), Samudra are designing Seaweed farms with wildlife in mind. It is nearly impossible to entangle in a taught rope. Farm design will ensure that lines are held taut at all times and sea states. Most cases of cetacean entanglement is evidenced to be from discarded fishing nets (ghost fishing) or from loose mooring lines or creel ropes.

This farm was licensed in 2018. In more recent Algae farm license processes, Marine Scotland, MCGA and NLB have asked for a navigational risk assessment, which includes emergency contact details to various organisations, including [BDMLR](#) and the [Scottish Entanglement Alliance](#). This is provided as "4 - AnC Re-application - Navigational Risk Assessment, MEAC & Decom Plan v1.1" for this Re-application process.

Samudra staff will visit the existing farm site as a minimum of once a week (weather allowing) and will contact these numbers if there is any concern over a cetacean in our farm lines. Samudra staff will be encouraged to attend the BDLMR courses, and we will assist in strandings and entanglements of animals wherever they may happen locally. The existing seaweed farm requires no acoustical deterrent devices (ADDs) to ward seals off. As with seals, Samudra vessels will never intentionally steer toward cetaceans seen in the water. Vessels will slow or where safe to do so, steer to avoid cetaceans seen in the water.

### 07.06 Foraging and Breeding Bird disturbance

Samudra's research has found many hundreds of seabird records over many decades entered on [NBN Atlas](#) within a 10km radius of Oban. Seabirds are often seen roosting on the buoys of similar seaweed and mussel lines on the west coast. They are an important resting provision for foraging birds throughout the year, but particularly in the breeding season.

In recent harvesting operations on the similar styled Mull seaweed farm, cormorants, shags and various gulls were perched on the surface floats of the farm whilst harvesting was underway in April and early May. These birds would have been in the early stages of nesting in the sea cliffs near to the site (within 100m) and were certainly undeterred by the vessel and human operations. Diving birds of various species are often observed swimming down below the seaweed lines to hunt (cormorants and shags are the most seen birds at seaweed farms). The seaweed attract many small fish (particularly juvenile lumpfishes), crustaceans and other arthropods, molluscs and various Annelida.

On the west coast of Scotland, it is not uncommon to see various divers (great, black and red necked, little grebes, goosanders and red breasted mergansers) over winter and throughout

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<sup>1</sup> [https://www.researchgate.net/publication/7704221\\_North\\_Atlantic\\_Right\\_Whales\\_in\\_Crisis](https://www.researchgate.net/publication/7704221_North_Atlantic_Right_Whales_in_Crisis)

<sup>2</sup> [https://media.fisheries.noaa.gov/dam-migration/wcr\\_2016\\_whale\\_entanglements\\_3-26-17\\_final.pdf](https://media.fisheries.noaa.gov/dam-migration/wcr_2016_whale_entanglements_3-26-17_final.pdf)



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the summer. Vessel movements around sea farm sites do not dislodge the birds from roosting on the floats or scare them off from foraging. Birds very quickly become tolerant of the human activity at the sites.

The seaweed farming vessel activity predicted by Samudra at their Aird na Cuile farm site will be low level (a day or a few days, a few weeks of the year) using small vessels (under 24m, mostly under 10m vessels), that are similar or the same vessels that will work and transit through the sea area throughout the year (Samudra intend to charter local fishing and work boats to service their needs at the farm site). We believe that any local birds or other wildlife will be tolerant to our levels of activity.

### 07.07 Benthic data and seabed disturbance (of PMFs)

The [Habitat classification by EUNIS 2019](#) for the existing consented area of the seaweed farm site is given as High Energy, Shallow Circalittoral Seabed, A5.3 Circalittoral mud. The anchor layout of the farm will be set to avoid any rocky reefs nearer the shoreline.

To secure the seaweed farm structure so it is robust enough to survive winter storms for many years, the farm structure is anchored to the seabed with steel 500kg and 750kg anchors. These anchors are designed to dig in to the soft benthic muds of the farm site. They quickly bury deep into the sediment and form a secure anchor to carry the load of the subsurface structure and floating surface structure (Fig 2).

Samudra are confident that once the deployment phase of anchors has been completed, which will have obvious impacts to the direct spots the anchors are set, that our operational activities will have a negligible impact on the benthic conditions of the site.

This has been discussed with Nature Scot on other seaweed farm consultations and it has been considered that, given that there are no chemical or feed additions, no faecal or waste deposits and that outputs, beyond the initial damage done during the initial construction phase where anchors are laid, there is negligible impact on immovable PMF species under or near a seaweed aquaculture site. As a benign aquaculture method, seaweed farming provides more habitat enhancements (roosting, feeding etc) than any negatives.

### 07.08 Eurasian Otter (*lutra lutra*) disturbance

Otters are a European Protected Species (EPS) and as such have legal protection from harm, disturbance and habitat interference. Samudra's research has found many otter records over the decades entered on [NBN Atlas](#) within a 10km radius of Oban, covering the sea farm site. Also, from discussions with local residents and marine users around the area, it was confirmed that otters are regularly seen on the shorelines, crossing roads and near rivers across the area, and that they had heard other residents discuss seeing otters as well.



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We have applied the precautionary principle and the section below discusses potential for disturbance to otter during operation of the seaweed farm. Otters are regularly seen on in most parts of the Oban/Lorn coast, including in the busy town of Oban. They can be remarkably tolerant of people, vehicle and vessel movements.

Nothing in Samudra's development or operational phases of the seaweed farm will constitute a threat to the life of an otter. Nor will any part of our operation touch land to damage or destroy their holts or holes. Landing of the seaweed uses an established piers at Oban.

The discussion on potential sources of disturbance can be split into 3 parts;

### 07.09 development phase disturbance

Our development at site will be of short duration (estimated 2 weeks but weather dependent). It will require a 16m to 22m vessel to lay the anchors into the seabed. The nearest anchors that will be laid to the shoreline will be 100m from the High tide mark. Cables strung from these anchors head directly away from the shore to surface structures.

NatureScot guidance suggests that "If otters are known or suspected to be breeding, the exclusion zone should normally be at least 200m radius. However, it could be reduced to 100m depending on the nature of the works, topography and natural screening. For shelters, or holts where otters are not breeding, the boundary of the exclusion zone should be a minimum of 30m.". These exclusions zones are nominally looking at physical changes to the land near otters. As the Seaweed Farm will be sited off from the coastline and will not physically touch or alter the holt or hole of any otter, we would hope that the 100m rule would apply as a maximum. It could be argued that the most direct disturbance to the otters could be the presence of any surveyor conducting an otter habitat survey on the shoreline.

A male otter's territory can be significant, using 20 km of rivers and coastline to hunt and defend up to 3 females against intrusion by other males. The female otters form sub-territories within, in which they produce up to 3 cubs, usually in early summer. The mother will rarely leave them for the first 10 weeks from birth at which point the cubs will begin to become mobile. They will then follow their mother as she hunts and suckles the young. She will use multiple holts and holes to dry off (otters don't like being wet!) and to sleep (which they do for more than half the day). They will nurture the cubs for a year up to 18 months to teach them to fish by catching and releasing live fish for the cubs to re-catch.

It is difficult (without the aid of photo traps) to assess whether otter shelters or holts are being used by a breeding otter or not as females with cubs reduce sprainting to avoid detection. Indeed, it is an offence use photo traps without appropriate licenses



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No works that are undertaken fall within the minimum 30m exclusion zone. The minimum distance from the Mean Low Water Spring (MLWS) and distance to Mean High Water Spring (MHWS) is 100m (sheer shoreline) to avoid encroaching into the shoreline area. The predicted timing of the installation of the Seaweed Farm is late summer, which will coincide with any otter cubs becoming fully mobile.

### 07.10 Operational phase disturbance

All operations will take place in daylight. Deployment periods will be October to November. Harvesting periods will be from mid-March through into late-May. The mainly nocturnal nature of otters will hopefully allow us to present no disturbance to feeding patterns.

### 07.11 Ongoing presence and its effects

For the greater part, the Seaweed Farm will be left unattended by vessels. Outwith the operational phases (including all evenings, nights and weekends during the operational phases) little or no activity will take place over the months of June, July, August or September (aka the summer fallow period) and after the Oct/Nov deployment, the Seaweed Farm will be left unattended in December, January, February and March (aka the winter growing period).

A brief diurnal phase of otter feeding during the shortest days of the year will coincide with the winter slow growing period, where the Seaweed Farm left mostly unattended save for occasional visits by small boat to check condition of the Seaweed Farm structure (a condition of license consent) and to take samples of the seaweed for quality and growth monitoring. We will ensure we do not visit the site near to dawn or dusk to prevent disturbance to otter feeding times during the hard winter months. This also a good practice for safe use of small vessels in winter. Similarly, the summer fallow period will see the Seaweed Farm left mostly unattended save for occasional visits by small vessel to check condition of the Seaweed Farm structure (a condition of license consent).

### 07.12 Shorelines of Aird na Cuile Seaweed Farm site

Most of the coastline rises sheer from the water and as such would be too dangerous to survey. These sections of coast would by their nature not be suitable for otters either.

The land directly behind the shore on this coast rise sharply as "raised beach" formations due to isostatic uplift. This creates a secondary sea cliff visual barrier between the shoreline and inland sites. This may present additional danger to anyone trying to cross the site. These areas, with their rock strewn scree surfaces may, along with the rocky coastline, provide suitable holes and caves that otter could use as holts and shelters.

As a precautionary principle, we have included mitigation (location and distance to shore, timing of works, lighting and landing area at established slipway).





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### 07.13 Water column and seabed shading

Seaweed cultivation Growing Lines are placed out at sea on the farm in late autumn and the lines over-winter there with little or no growth on the lines until spring. The seaweed on the lines grows rapidly February through to April and is all harvested out by end of May. The seaweed lines are well spaced apart to prevent them rubbing and with the low angles of the sun in the spring months the estimate of shading of the seabed and water column is less than 1% in Dec, less than 4% in Jan, less than 7% in Feb, less than 10% in Mar, less than 15% by end of April and the seaweed is harvested out by end of May. The chosen site of the seaweed farm is light benthic mud which does not hold wild seaweed plants that require sunlight for photosynthesis. It is therefore calculated that the seaweed farm will have a negligible effect from shading on the wider marine environment.

### 07.14 Nutrients

Seaweed cultivation does not require the input of feed or conditioning chemicals. All the plants require to grow is sunlight. Seaweed draws in nutrients and minerals essential for its growth. These are then available to us when we consume the plants. Samudra's sea farm site is in a relatively open sea loch which attaches to the significant sea currents of the Atlantic/Minch waters. Strong tides replenish the nutrients constantly preventing nutrient depletion in local waters.



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### 08 Samudra Biosecurity Plan

This section forms the basis of a stand alone policy that will be broadened and become Samudra's Biosecurity Plan. In addition to this section, please see the proforma Biosecurity Plan (Annex 1 – Biosecurity Plan – Mock Template).

#### 08.01 Invasive non-native species (INNS)

INNS are one of the biggest global threats to biodiversity, undermining the inherent resilience of ecosystems and causing significant economic costs for sectors such as agriculture and fisheries. Along with disease transfer, INNS cost £billions per year globally in harvest and infrastructure damage and the loss of local biodiversity presents an incalculable threat to future generations.

Samudra have based their Biosecurity Plan around such publications as Nature Scots' Commissioned report - [Marine biosecurity Planning](#). Samudra will lay out each part of their existing seaweed farm operations and then describe the actions they will ensure are undertaken to protect from transfer of INNS or disease.

It is considered that overall, INNS are a **Low Risk** issue for seaweed aquaculture as the main materials used for seaweed cultivation are placed in the water in October and retrieved by May the following year. No feeding barges or cages are used in seaweed cultivation and no equipment or vessels transfer to other aquaculture sites.

Only native species will ever be grown on Samudra's farm and seed stock taken from the local shoreline only. No seed stock of non-native species will be brought in. All equipment used will be thoroughly washed before and after use to prevent the spread of INNS. Cards showing the common INNS species will be supplied to staff and contractors to identify potential INNS growth on the farm structure.

All Samudra staff and contractors will be trained in INNS recognition via ID cards placed on vessels, shore bases and at the Samudra's processing Hub and an effective reporting process put in place. In the event of the positive identification of an outbreak, staff will ensure that no product affected leaves the site. Any equipment and ropes affected will be taken ashore and will be treated and Nature Scotland informed immediately. **Low Risk**

We do not envisage disease issues at our seaweed farm site as would be seen in animal husbandry around mussels, oysters or finfish. Growing Lines are deployed for only 7 months then returned to shore for cleaning. **Low Risk**



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### 08.02 The Farm Site

The existing site of the Seaweed Farm at Aird na Cuile Loch is over 1km from the nearest habitation on the coastline. As such the site is well away from any direct sewage or chemical outputs from direct source pollution.

Samudra will ensure that all harvest taken from the farm site will be washed ashore in fresh water at their processing Hub. The waste water from their processing is disposed through the areas' traditional Sewage Treatment Works (or septic tank system), which digests any materials in a microbial process, destroying and organic contaminant. Plant waste from the processing will be taken to be composted locally. No waste material from Samudra's processing facility will find its way back into the sea. **Low Risk**

### 08.03 Seaweed Species

The main species Samudra intends to cultivate are large brown kelps that have a proven track record of line cultivation in Scotland - Atlantic wakame (*alaria esculenta*) and sugar kelp (*saccharina latissima*) primarily for the human food market. A third large brown kelp, oar weed (*laminaria digitata*), will be included in the Marine Scotland licence process in readiness should market demand or technologies change to such an extent that its cultivation becomes commercially viable. Technology in cultivation of highly prized red and green seaweed species is developing rapidly, so we will be apply for license consent for some of these species also.

All of the above species occur naturally along the local coast. No seaweed stock will be brought in from outwith the Oban/Lorn coastal area. All seed stock will be collected from rocky shores near the farm site.

All laboratories that Samudra will invest with the duty of seaweed seed production will be fully accredited and work to hygiene standards to ensure no cross contaminated of seaweed stock (or diseases) are brought back to Samudra's site. **Low Risk**

### 08.04 In water equipment

Two different systems of farm design are currently being trialled across Scotland. The "longline system" and the "grid system". Both use subsurface anchored structures based on conventional aquaculture structures. These structures are fixed and permanent. Growing lines will be deployed each autumn and removed each spring during harvesting.

No equipment or ropes based at the farm site will be moved to another site and no equipment or ropes used on another site will be brought in. Any equipment or ropes brought ashore from the Samudra farm site will treated by cleaning with fresh water above the high tide mark. All equipment stored ashore will be kept separate from equipment from any other sites.



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A minimum of waste plant material from the initial harvest operation will fall to the seabed at the site. Similarly, any crustaceans that accumulate on the lines or floats at site that are knocked off during maintenance or harvesting operations will fall to the seabed to be consumed in the seabed sediments or by detritivores that naturally occur there. Any equipment that has accumulated crustaceans or algae on them that is brought ashore will be washed down with fresh water and along with air exposure cause the demise of sea grown fouling. **Low Risk**

### 08.05 Seeding Process

Samudra intend to cultivate several native species at the farm site. Three main target seaweed cultivation species Atlantic wakame (*alaria esculenta*), oar weed (*laminaria digitata*) and sugar kelp (*saccharina latissima*) are large brown seaweeds or kelps found on lower littoral and sublittoral rocks exposed to strong wave action across the Oban/Lorn coast. The plants have similar seeding seasons, by scatter seeding into the water in late Nov through to early January. Fruiting bodies develop on varying parts of the seaweeds (near the base of the plants in the case of Wakame or along their fronds in the other species). While fertile, seeded stock will be collected from local shore sites and will be cultured onto growing medium at commercial hatcheries that are emerging around Scotland and beyond.

Dulse (*palmaria palmata*) and pepper dulse (*osmundea pinnatifida*) are valuable, small red seaweeds and sea lettuce (*ulva lactuca*) a valuable, small green seaweed that are grow native on the local coast. At the moment they are mostly harvested but the technology to cultivate them is developing. Samudra are including these species in their application in anticipation of the technology to viably farm them becoming available at a future date.

The volumes of seeding plants required to be collected are very small, a standard bucket of fertile seaweed can nurture 20km worth of seeded farm growing line which can produce over 150 tonnes of mature seaweeds.

The species farmed are all native and grow abundantly locally but inhabit the very lowest of the shoreline only exposed on low spring tides. This does not lend them to large scale shore harvesting. So cultivation is seen by Samudra as a necessary method to grow these seaweeds at scale. There are no chemical additions or treatments used for the seaweed growing process. There are no feeds introduced to the water. The ropes used for growing are removed at the same time as the seaweed is harvested. So this form of sea farming has a very slight impact on the environment, compared to that of some other aquaculture means. **Low Risk**

### 08.06 Line Deployment and Harvesting

Deploying seeded seaweed Growing Lines onto the farm site occurs in October of each year. Propagated material is affixed to ropes via a seeded string medium or directly onto ropes using a binder solution. The Growing Lines are deployed by existing small creel vessels or local



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workboat landing craft style vessels. The Growing Lines are narrow ropes (10mm or 12mm) and are affixed in the water to the permanent sea farm structure in a horizontal (or elongated V) pattern at depths down to 5m below the surface. The lines are harvested of the resulting seaweed growth between late March through to Late May/June. The site will be cleared of all Growing Lines at end of each harvest period.

The vessels used to deploy the seaweed lines onto the farm site and harvest the resultant seaweed are based on the Oban/Lorn coast and work locally. They antifoul their hulls annually as a part of their own maintenance schedule. It is therefore unlikely that non-native invasive species will be brought to site (or to shore) by this route. Regular monitoring of seaweed growth will be done via visits to the seaweed farm by small vessels. These vessels are stored out of the water when not in use, their hulls washed in fresh water each time they are retrieved.

Low Risk

### 08.07 Harvesting Process

Harvesting will be undertaken by automated harvesting machines being developed which will use a simple roller frame with cutting heads that will trim the useable frond of the plant into bins or boxes while leaving the rope and growing base (stipe) of the plant intact to either be redeployed for further growth (coppicing method) or collected for cleaning ashore for future years' harvest deployments.

All harvesting equipment and vessel decks are washed down at site with seawater hoses. All equipment and ropes brought ashore are washed thoroughly with fresh water and stored ashore. Low Risk

### 08.08 Onward Processing

To keep the seaweed to the highest standard the product is brought ashore and loaded onto temperature controlled vehicles, then is processed as soon as possible. Drying is the main processing method, essentially lowering the water content without using excessive heat (which would cook the plant) similar to herb processing. This creates a stable, storable product that can be rehydrated as an ingredient. For other processing routes, seaweed will be kept as a wet, fresh ingredient but with far shorter shelf life.

For either processing routes, Samudra will ensure that all harvest taken from the farm site will be washed onshore in fresh water at a proposed processing Hub in Oban or at processing facilities of client partners. The waste water from their processing will be disposed through the areas' traditional Sewage Treatment Works (or septic tank system), which digests any materials in a microbial process, destroying and organic contaminant. Plant waste from the processing will be taken to be composted locally. No waste material from Samudra's processing facility will find its way back into the sea. Low Risk



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### 09 Lost Lines and Site Waste

The seaweed farm site will be visited on a weekly basis throughout the year to ensure the structure and any growing lines deployed (Oct to May) are fixed and tensioned appropriately. Any broken lines will hopefully still be attached at one end and so can be recovered and either reattached or removed. During fallow periods (June to Oct), the visits will be a simple passing visit by a local vessels to ensure all floats are present and that all is well with the site.

There are no chemicals or cleaner additions to the water column at the site from any of Samudra's activities. The seaweed are plants and require only sunlight and the seawater to flourish.

Any waste generated from the project will be disposed of ashore through local, certified commercial waste disposal. All ropes and equipment will be stored ashore during fallow periods of the farm (May to Oct). And all cleaning of ropes and equipment will be done ashore. There are no Special Waste requirements envisaged.

Work is underway to find the perfect growing medium for the seaweed lines to reduce the waste rope volumes to an absolute minimum. This will take time to assess as we check for the ability of different ropes to be cleaned and reused without losing structural strength or foul the new seeded seaweed of the next harvest. We will also be very watchful for plastic particulates being passed from older ropes into the growing products. Samples will be taken throughout each growing season to determine a whole range of factors of the seaweeds development.

Samudra are forming research partnerships with multiple leading universities. One area of research we are leading as an industry partner is biodegradable Growing Lines. We will be beginning our operations with tried and tested techniques and equipment, but also trialling, and in time hopefully fully committing to using ropes for our Growing Lines with an ability to breakdown harmlessly in the environment. We cannot divulge at this time the detail of the research due to its commercial sensitivity but are assured that the resultant ropes will not be based on hydrocarbon derived plastics.

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### Annex 1 – Biosecurity Plan – Mock Template

#### MARINE BIOSECURITY PLAN

Site Name or Description of Operation:	Aird na Cuile Seaweed Farm
Site/Operation Location(s):	Aird na Cuile (6km south of Oban)
Plan period:	Aug 2024 to Aug 2025
Biosecurity Manager:	Stevie Jarron

#### Site features affecting biosecurity:

Salinity	Full - 34 and 35 grams per litre
Submerged structures	3 x Special Marks (3 anchors and risers)
	18 x 200m double headlines (63 anchors and risers)
	50 x 9 x 100m Growing Lines
Non-native species known to be present	None

#### Vessel types using the site/involved in the operation:

	Vessel type	Risk factors; Pathway, speed, biofouling control	Risk: High/Medium/Low
1	Multi-Cat	Local harbours to site, 8 knots, vessel antifouled annually	
2	Landing craft	Local harbours to site, 8 knots, vessel antifouled annually	
3	Creel boat	Local harbours to site, 8 knots, vessel antifouled annually	
4			
5			
6			

#### Site Activities which have a significant risk of introducing or spreading non-native species:



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Activity Description	
1	No activities are seen as significant risk of introducing or spreading INNS
2	
3	
4	
5	
6	

### Biosecurity Control Measures – Instructions for staff/contractors/site users:

Who	What	Where	When
Charter Vessels	Samudra Biosecurity Plan	Given to Charter company by Samudra	Before contract commences
Farm staff	Samudra Biosecurity Plan	Training given to Samudra staff by Farm Manager	On induction, annually reviewed
Processing Staff	Samudra Biosecurity Plan	Training given to Samudra staff by Processing Manager	On induction, annually reviewed

### Site surveillance and reporting procedure:

Site Reporting log (aka MEAC log)	All activities relating to the farm site to be logged. This includes (but not limited to) debris entanglement, damaged lines, any wildlife interaction (including sightings of cetaceans), vessel interactions, suspected INNS
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### Contingency Plan:

Action	Responsibility	Location of Equipment
Suspected INNS found on Structure	Farm Manager	On vessels
Suspected INNS found on Growing Lines	Farm Manager	On vessels
Suspected INNS found amongst Harvest	Processing Manager	In Processing factory

### Location of biosecurity logbook:

With Farm Manager

Plan Review Date: 01/08/2025