

Kaly Group Limited
Loch Bay Seaweed Farm Environmental Responsibilities



Details

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Loch Bay Seaweed Farm Environmental Responsibilities

01 Introduction

Kaly Group Limited (Kaly) propose a seaweed sea farm in Loch Bay, a sub-loch system of Loch Dunvegan, in Northwest Skye. The sea farm site has been selected for its suitability to cultivate seaweed and for local pier and harbour access.

The information in this document will compliment other documents –

- Document 1 - Method Statement (Biosecurity Plan Template as Appendix)
- Document 2 - Navigational Risk Assessment and MEAC
- Document 3 - Vessel Management Plan
- Document 4 - Environmental Responsibilities (this document)
- Document 5 - Report to Inform Appropriate Assessment (RIAA)
- Document 6 - Planning Statement - Scotland's National Marine Plan Policies
- Document 7 – Pre-Application Consultation (PAC) Report
- Document 8 - Additional Coordinates Forms
- Document 9 – Landscape and Visual Photomontages

This document is more specifically aimed at Nature Scot's needs and has been heavily influenced by direct guidance from them during the Pre-Application Consultation (PAC) process in this and other seaweed consenting processes. It attempts to set down Kaly's understanding of the impacts their development will have on the site of the proposed seaweed farm, the transit route and shore base area and the wider environment.

A key barrier to the development of the seaweed industry in Scotland has been creating sufficient scale of cultivation to substantiate investment into Primary Processing. Kaly intend to achieve this through the development of the proposed farm site. By doing so, a guaranteed supply of seaweed can be developed to meet the known demand for quality processed kelp in the food, feed, and fertiliser markets in addition to emerging high-value markets such as biochemicals and nutraceuticals.

Provided both Kaly and the Scottish seaweed industry grow as expected, the Kaly model will be a template for Kaly's further deployment of farms and processing hubs along the west coast of Scotland using a hybrid franchise/cooperative farming model with an associated Primary Processing hub close to the farm sites.

During the initial years, partnerships with existing secondary processors and product developers/manufacturers will be established to meet known demand for quality grade processed seaweed. Whilst Kaly intends to explore opportunities for further vertical integration, the business model is predicated on first scaling up the supply and processing of seaweed biomass in a professional and cost-effective manner. This will in turn unlock new markets and new customers in existing markets both for Kaly and for the Scottish seaweed industry. Kaly intend to demonstrate an exemplary approach to the cultivation of seaweed in Scotland to help the industry reach its considerable potential.

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A processing 'Hub' will be formed locally that the sea farm can use for equipment, training opportunities, undertaking seeding culture, as well as Primary Processing to stabilise the harvested seaweed. The Hub envisages the generation of renewable energy; localised eco-tourism; educational programmes, and other potential outlets for communities to showcase local produce and products. Future land based elements will be agreed through separate land based consents following discussion with the local authority.

02 Farming species choice/Seeding Process

Kaly intend to cultivate several native species at the Loch Bay site. Three main target seaweed cultivation species are Atlantic Wakame (*alaria esculenta*), Sugar Kelp (*saccharina latissima*) (and potentially) Oar Weed (*laminaria digitata*). These are large brown seaweeds or kelps found on lower littoral and sub-littoral rocks exposed to varying degrees of wave action across the Skye 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 Skye coast. At the moment they are mostly shore harvested by hand, but the technology to cultivate them is developing. Kaly 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 wild seeding plants required to be collected will be very small, a standard bucket of fertile seaweed could nurture 20km worth of seeded farm growing line which could produce over 150 tonnes of mature seaweeds for harvesting.

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 by Kaly 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. 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 farm site selected has a 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 the first few year's harvests.

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During initial years we envisage under 24m vessels being used by Kaly/Farming Partners for seeding, maintenance, and harvesting which work best in sheltered inshore sites rather than exposed, more challenging locations. We believe it's important to select sites which strike a balance between anticipated yield, ease of cultivation, and proximity to landing points to give each site and farming partner the best possible chance of success.

03 Farm Structures

Two different systems of farm design are currently being trialled across Scotland:

1. The 'longline system' consists of 200m anchored structures based on mussel farm longlines. Each longline unit has 5 x 200m growing lines at a spacing of 5m apart (1,000m of growing line per longline unit). To allow for anchoring and vessel space between lines, each longline is given 300m x 75m of space. The system is at an early stage in development and we may trial some longline systems in future to test design and effectiveness.
2. The 'grid system' consists of a 200m x 100m grid of subsurface ropes and anchors across which 100m long growing lines are set. From previous experience growing lines set out at 2m spacing between lines have shown to interact and twist. Our intention will be to initially trial growing lines at 4m 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 4m spacing each grid unit can take 50 lines (5,000m of growing line per grid unit). To allow for anchoring and vessel space between lines each 200m x 100m grid unit is given 300m x 150m of space, plus additional room around them for anchoring.

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

The Lease Option Agreement (LOA) consent area secured from Crown Estate Scotland (CES) is much larger than the actual sea area that will be taken up by farm structures. As discussed with Nature Scot representatives, this allows for flexibility in the setting of anchors to meet local subsea topography, and to ensure that structure stay clear of rocky reefs and intertidal rock areas which hold many important sea-life habitats.

As discussed with Northern Lighthouse Board representatives, the outer corners of each farm area will be delimited by Special Mark buoys. These are the conventional system for marking aquaculture sites and are large, yellow-coloured floating buoys. Each buoy has a top piece with a yellow St Andrews Cross and solar panel charged battery powered lights which 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.

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04 Loch Bay Seaweed Farm

04.01 Introduction

Loch Bay is a sub-system of Loch Dunvegan. It is landlocked to the south and east, has a complex of islands and rocks to the west and is open to the North Minch to the north. The site of the farm is 2km over the loch from the small hamlet of Stein and no dwellings overlook the site. There is 500m clearance from the farm to an anchorage to the north. The passage between Loch Bay and Loch Dunvegan to the west is over 250m wide. The farm will be over 100m from the sweeping shoreline of Rubha nam Both and Lovaig Bay to the south (Fig 1).

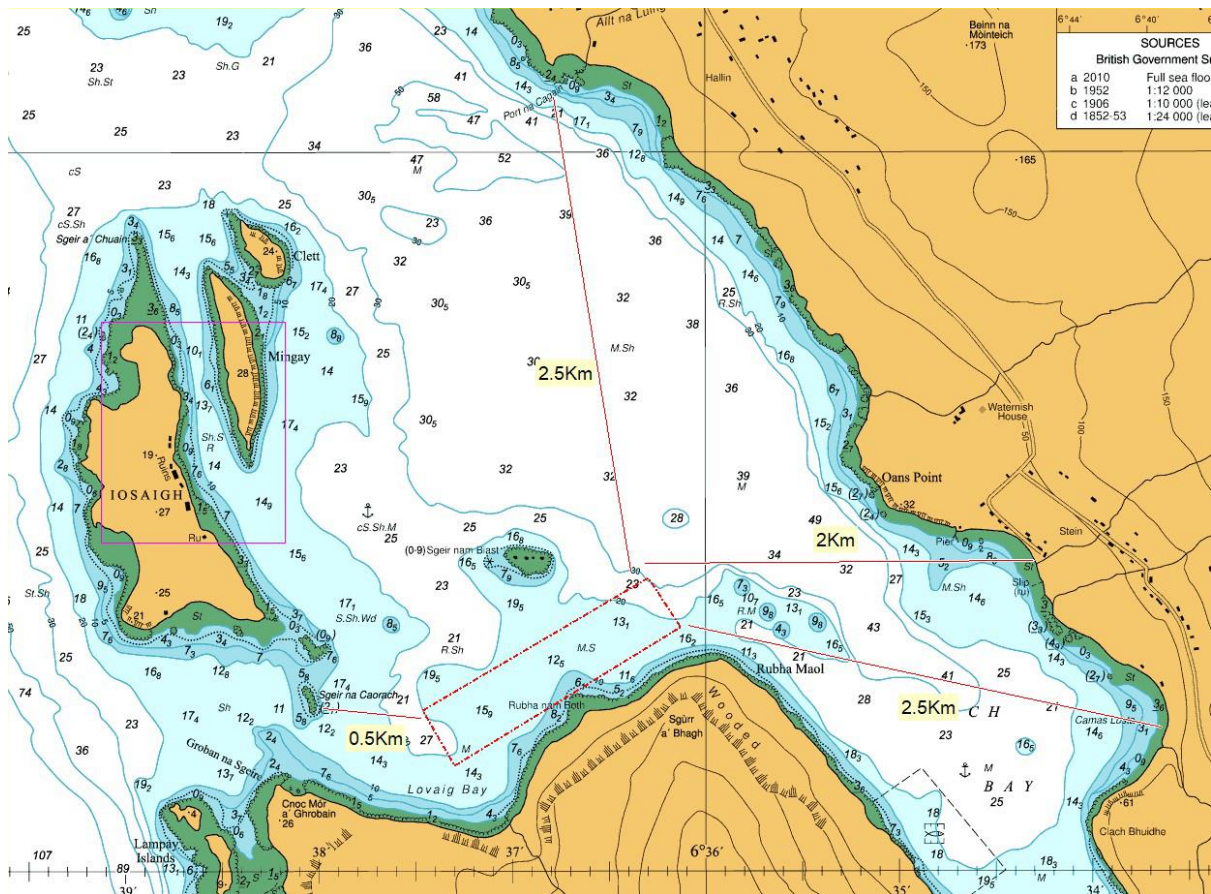


Fig 1 – Chart of LOA and distances from local coastlines.

04.02 Growing conditions

The chosen farm site in Loch Bay is to the far west of the Loch Bay sub-system. The site has far better current flow than deeper into the Loch Bay system (to the south and east) where several companies have attempted to farm salmon in the past. There is good current flow between the islands and in the upper bay. This will provide nutrient exchange well above minimum requirements for sugar kelp seaweed growth. Local knowledge indicates that despite the appearance of shelter, there can at times over the winter be significant swell reaching into the farm site area, useful for maintaining clean seaweed and may make it a site suited to Atlantic wakame.

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04.03 Farm capacity

The proposed sea farm site we are applying for has a total consented area of approximately 40.5 Ha, but the actual area under cultivation is actually 16Ha in 8 x 2 Ha grids. Using the space economically within these grids we hope to be able to deploy growing line lengths of up to 40 km. Local seabed topography and other practical considerations at the sea farm site may reduce the number of Farm Units and therefore the length of growing line deployed. A contingency of possible reduction in growing line capacity will be applied in financial modelling.

04.04 Farm Development

The proposed site of a seaweed farm at Loch Bay near Dunvegan will become a Research and Development (R&D) and training farm to test and refine seeding, farming, and harvesting techniques, explore emerging technological innovations and develop intellectual property.

The Loch Bay sea farm will provide the opportunity for prospective seaweed farmers to see and experience first-hand how best practices in seaweed cultivation can be implemented. Training will be given at the site to integrate the results of research and knowledge exchange between seaweed farmers experiences at other sea farms.

05 Site Designations

Integral to the consenting process are 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.

05.01 Nature Scot scrutiny of designations

The proposed 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.

Within the Loch Bay sub-system of Loch Dunvegan is the Ascrib, Isay and Dunvegan SAC <https://sitelink.nature.scot/site/8193>. This SAC is set up for the protection of harbour seal (*phoca vitulina*), which is abundant in Scottish waters, but declining worldwide (Fig 2)

The Dunvegan Loch system is outwith, but very near to the boundary of the Hebrides Marine Protected Area (MPA) <https://sitelink.nature.scot/site/10474>. This MPA is set up for the protection of basking shark (*cetorhinus maximus*), which frequent the waters of the West of Scotland in summer and into the autumn.

There is also a small area at Dunvegan Head which is designated as a Marine Consultation Area Marine, which is non-statutory. The interest in that area are the coarse gravels and pebbles in the lower infralittoral which have a rich biota. It has been agreed with Nature Scot that those habitats won't be affected by Kaly's proposals.

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There is no specific [EUNIS habitat classification](#) for the proposed sea farm site. From sea chart information it is likely to be A5.25 Circalittoral fine sand or A5.26 Circalittoral muddy sand.

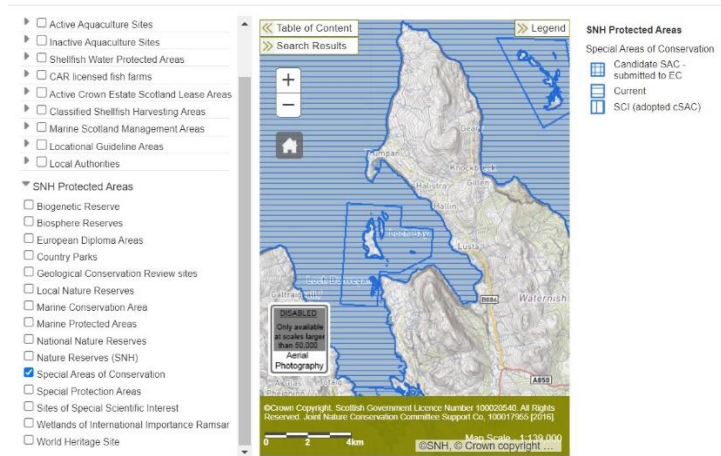


Fig 2 – SAC designation in Loch Bay for Porpoises and Harbour Seals.

Given the environmental sensitivities, Kaly commissioned a 'Report to Inform Appropriate Assessment' (RIAA) – see Document 5 of the application pack. We sent draft copies of the application documentation to NatureScot and have addressed the comments provided. We will continue to consult with Nature Scot's specialist advisors as the Marine Licence progresses. If there are any updates to the application pack as a result, we will submit information to the MS Case Officer.

05.02 Underwater Archaeology

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

05.03 SEPA Management Controls

The Loch system has Marine Scotland Management schemes in place for disease/lice control and for nutrification control (Fig 3).

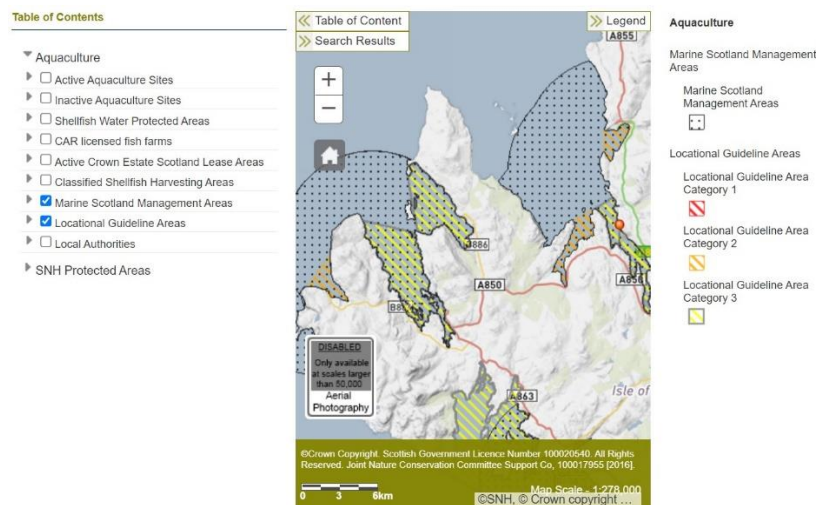


Fig 3 - Marine Scotland Management schemes

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These classifications of the waters will mean Scottish Environment Protection Agency (SEPA) have more management control over water quality and will therefore be more interested in our license applications than they usually are in other areas.

05.04 Other Marine users

Within Loch Dunvegan there are 3 active Marine Farms, all for Atlantic Salmon, run by Scottish Sea Farms. Within Loch Dunvegan sub system Loch Bay, there is an inactive site for Atlantic Salmon run by MOWI (Fig 4).

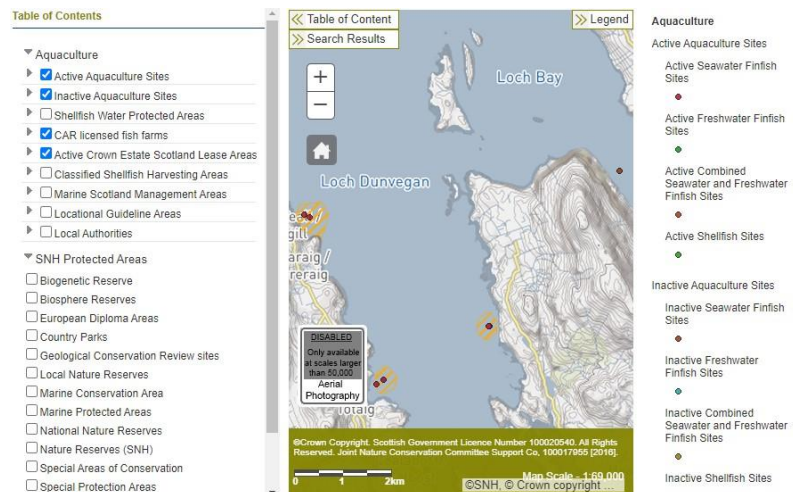


Fig 4 – Other Marine Users

A small local creel fleet work this loch from the pier at Dunvegan. Kaly intend to partner with local vessel owners to compliment the work at the Loch Bay farm.

06 Visual Impact and other marine users

Landscape and Visual Baseline

The proposed seaweed farm is located offshore in Loch Bay, west of the Waternish peninsula in the northwestern part of the Isle of Skye. The application site is located 65m north of the shore (Mean Low Water Spring, MLWS) below the steeply stepped north slopes of Beinn Bhreac (314m AOD). There is no nearby habitation, the closest residential receptor and road being located c. 1.5km to the east in the settlement of Stein.

The landscape character of the wider island area is described by NatureScot (2019)¹ in two landscape character types (LCTs):

- The majority of the high ground on Waternish and Beinn Bhreac, some sections of coast and the islands separating Loch Bay from Loch Dunvegan are described as **Stepped Moorland LCT**

¹ <https://www.nature.scot/professional-advice/landscape/landscape-character-assessment>

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- The settled coastal strip on the east of Loch Bay is described as **Farmed and Settled Lowlands - Skye & Lochalsh LCT**

NatureScot's national coastal character map² describes northern and western Skye, including the Loch Bay area, as **Low Rocky Island Coast** coastal character type, there is currently no regional or local subdivision into smaller areas.

There are no national landscape designations which cover the site or surrounding area. However, much of western Skye, including the site and surroundings, lies within **North West Skye Special Landscape Area**, a Highland Council local designation³. The nearest settlement, Stein village, is a conservation area with several listed buildings.

There are no residential properties, core paths or other visual receptors on the closest land south of the site, which is generally difficult to access, with no paths. The closest visual receptor locations are:

- several small settlements and scattered properties on the west coast of Trotternish overlook Loch Bay which also contain a number of small-scale visitor attractions including the Stein Inn.
- a core path between Gillen and Waternish House overlooks Loch Bay
- the B886 and minor roads pass through the settlements overlooking Loch Bay
- the coral beaches to the west of the site are accessed by a core path to the north of the settlement of Claigan. Informal paths access the small knoll of Cnoc Mor a Ghrobain, from where the site is visible.

Kaly engaged Landscape Architects (Ironside Farrar) to produce a series of photomontages to show how the proposed seaweed farm would be viewed from five representative viewpoints (see map Fig 5). The montages (Document 9) were produced in accordance with best practice guidance⁴.

The Proposed Development

The proposed Seaweed Farm will have the lowest possible profile, ensuring visual impact is kept to a minimum. The visible surface equipment (when fully deployed) will be a series of 16 parallel mussel farm style headlines, each 200m long, with 150l black buoys every 10m. This will be the permanent structure of the farm.

² <https://www.nature.scot/professional-advice/landscape/coastal-character-assessment#:~:text=Coastal%20Character%20Assessment%20identifies%2C%20describes,focus%20on%20the%20terrestrial%20landscape.>

³ https://www.highland.gov.uk/downloads/file/2937/assessment_of_highland_special_landscape_areas

⁴ <https://www.nature.scot/professional-advice/landscape/landscape-tools-and-techniques/landscape-and-visual-impact-assessment>

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The anchoring system will remain in soft benthic muds away from any rocky reef systems. 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).

Viewing Points

- 1 Trumpan Churchyard
- 2 Waternish Hall, War Memorial
- 3 Lusta, by the Thatched Cottage
- 4 Skyeskyns Car Park
- 5 Stein Inn

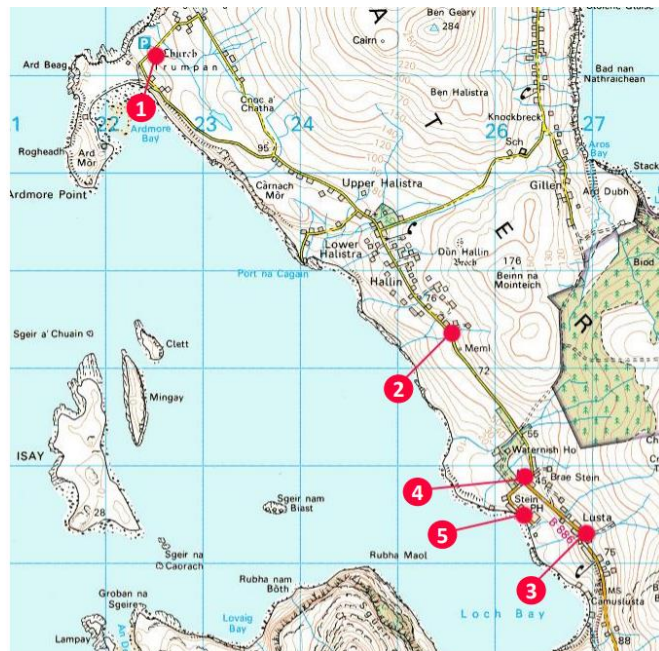


Figure 5 – Representative Viewpoints

Seasonal (Oct to May) Growing lines will be deployed, which are seeded with seaweed spores. They will be held under tension down to 5m subsurface.

The most visible indicator of the farm will be Special Mark buoys placed to clearly mark the outer limits of the site for mariners. At other similar aquaculture sites, the specific details of these special marks are given by MS-LOT/NLB as;

- a) The site is marked with 2 lit yellow buoys fitted with yellow 'X' topmarks.
- b) Each light displays a character of flash one yellow every five seconds (FI 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.

Any other special arrangement for lights will be recommended by NLB and MCGA during this application process and will form part of the license conditions of the site. Discussion with NLB and RYAS have already taken place. All discussions with other Statutory and stakeholder consultees are detailed in the PAC Report submitted along with the full application package.

The site is within a 1nm, safe sea journey of the small slipway at Stein and a 6nm, sea journey to the pier at Dunvegan. Kaly intend to use these facilities to safely move crews and vessels between the farm site and shore facilities to operate their proposed farm. This will bring economic and social benefits to the communities of the area.

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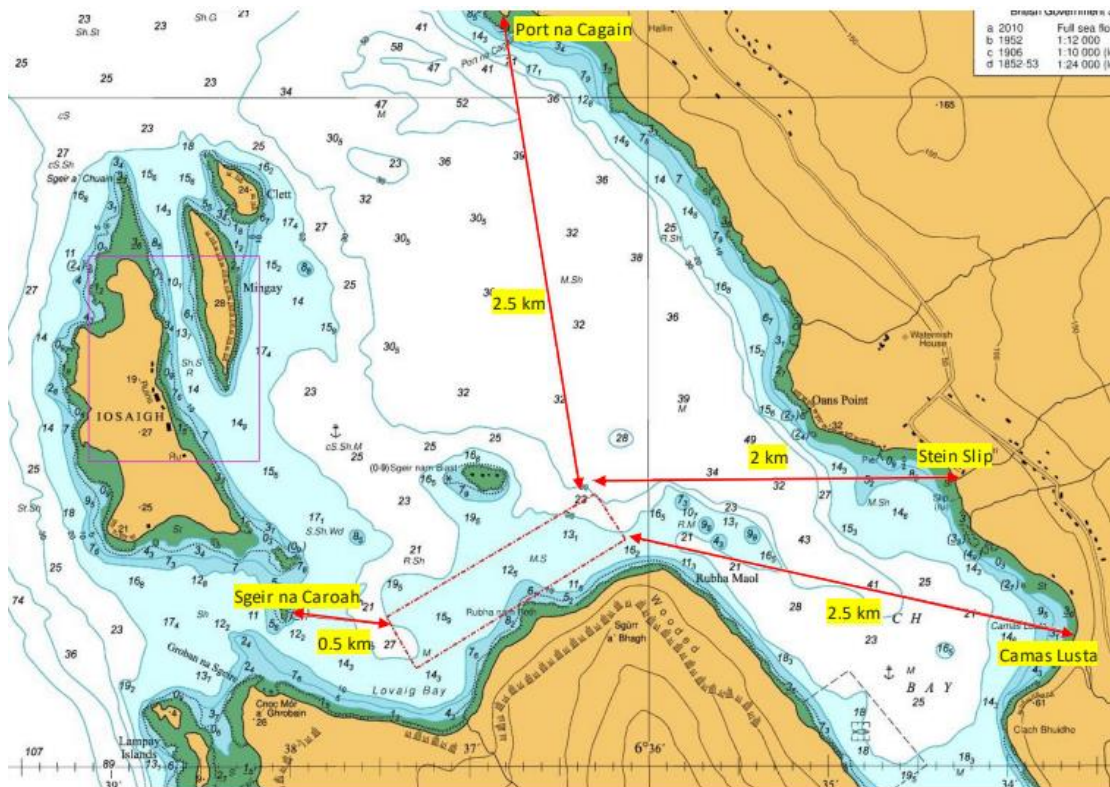


Figure 6 - Relative Distances to Key Features in Loch Bay

Potential Landscape and Visual Effects

The visualisations in Document 9 show the site location and the appearance of the proposed seaweed farm as seen from five land-based viewpoints (Figure 5) to the east and north of the site, at distances between two and five kilometres.

They demonstrate that the visible elements of the proposals would not be prominent, seen from the land overlooking Loch Bay:

- At 5km (VP1 Trumpan Churchyard) they would not be perceptible.
- At elevated viewpoints between 2.4km and 2km (VPs 2 -4) the grid of black buoys is likely to be visible in calm conditions, but less easily discerned in waves.
- Close to the shore (VP5 Stein Inn at 2km) the black buoys may be visible as a line in calm conditions, but the grid layout would not be discerned.
- The four yellow marker buoys would be noticeable from all but the furthest viewpoint.
- At night time in clear conditions the lights on the marker buoys are likely to be visible within a few kilometres.

The visualisations demonstrate that the proposed seaweed farm would not be prominent when seen from the closest surrounding land and settlements and that visual effects on the closest receptors would be modest. There would not be a noticeable change in the character of the wider surrounding landscape and seascape. NatureScot recommended contact with

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Highland Council relative to potential impacts on views from Cnoc Mor a Ghrobain and this has been undertaken with response awaited.

07 Wildlife Considerations and the environment

07.01 Introduction

As seaweed cultivation is still a relatively novel industry, Kaly is aware that this may be a new experience to Statutory Bodies and Stakeholders alike. Kaly has been closely consulting with all the diverse stakeholder groups from the earliest concept phases of this project to ensure that all risks are identified and suitable mitigation in taken.

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. Kaly are aware of the potential for impact on wildlife, most notably seabirds, seals and cetaceans which the area has varying designations for. In recognition of the environmental designations and species they support, Kaly commissioned a 'Report to Inform Appropriate Assessment' (Ironsides Farrar and ECOS Countryside Services LLP). This has been informed by a range of baseline evidence collated by on the interactions between seaweed farming and wildlife. 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, Kaly 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 Kaly 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.

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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. Kaly's research has found 23 harbour seal records over many decades entered on [NBN Atlas](#) (within a 10km radius of Stein, covering the sea farm site).

Within the Loch Bay sub-system of Loch Dunvegan is the Ascrib, Isay and Dunvegan SAC <https://sitelink.nature.scot/site/8193>. This SAC is set up for the protection of harbour seal (*phoca vitulina*), which is abundant in Scottish waters, but declining worldwide.

The proposed seaweed farm site lies along the edge of the sea boundary, but does not touch the physical rocky shorelines of the SAC designated site. The proposed farm structures will be over 500m from the intertidal rocks of Sgeir na Caorach to the west and over 300m from the intertidal rocks Sgeir nam Biast to the north. The shoreline of the island of Iosaigh is 1,650m to the North west of the site. These are 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](#)".

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

07.04 Kaly mitigation to avoid seal disturbance

Kaly vessels and crew will be carefully trained on how to interact with wildlife. Many Kaly staff will be local to the north west Skye 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 proposed 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 proposed farm site 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.

With the extended seal moult period into at least mid-September, we will ensure that this is the earliest that we would undertake structure deployment, such as installing moorings.

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- Kaly propose mitigation for vessels and staff to minimise the possibility of seal disturbance at all times of year. We will ensure our vessels (and those of any contractors) will only access the proposed sea farm site from the oblique ends of the farm area, from either the western Dunvegan end or the eastern Stein end. We have also been recommended by NS that it is worth mentioning our transit route map (in the accompanying document “Kaly LB Vessel Management Plan”) already shows boats transiting via the head of Loch Dunvegan giving Lampay a wide berth, but highlighting the importance of that area as Lampay is another important seal haul-out.

This will ensure that vessels are kept as far as possible from potential haul outs on the intertidal rocks described above. Kaly 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. All this has been clearly laid out in the accompanying document “Kaly LB Vessel Management Plan”. This mitigation is also discussed in the Report to Inform Appropriate Assessment (Document 5).

07.05 Cetacean Entanglement

Whilst there have been no reported cases of entanglement of cetaceans in kelp longline farming (Kraus et al., 2005⁵; NOAA, 2016⁶), Kaly are designing their Seaweed Farm with wildlife safety in mind. It is nearly impossible to entangle in a taught rope. The 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.

As part of the Application process, Marine Scotland, MCGA and NLB ask for a navigational risk assessment, which includes emergency contact details to various organisations, including [BDMLR](#) and the [Scottish Entanglement Alliance](#). Kaly staff will visit the proposed 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. Kaly 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 proposed seaweed farm requires no acoustical deterrent devices (ADDs) to ward seals off. This prevents disturbance and echo location damage to cetaceans who may travel into the Loch Bay system. We have no records of large baleen whales entering the relatively restricted waters, but porpoises and dolphins certainly are seen.

⁵ https://www.researchgate.net/publication/7704221_North_Atlantic_Right_Whales_in_Crisis

⁶ https://media.fisheries.noaa.gov/dam-migration/wcr_2016_whale_entanglements_3-26-17_final.pdf

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As with seals, Kaly 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

Kaly's research has found many hundreds of bird records over many decades entered on [NBN Atlas](#) (within a 10km radius of Stein, covering the sea farm site). Most of these records are of moorland species, but many waterfowl and seabird records are also counted here. Birds are often seen roosting on the buoys of similar seaweed and mussel lines on the west coast and northern isles. 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 lumpsuckers), crustaceans and other arthropods, molluscs and various Annelida.

[Redacted]

[Redacted]

[Redacted]

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[Redacted]

The seaweed farming vessel activity predicted by Kaly at their Loch Bay 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 (Kaly 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.

[Redacted]

07.07 Benthic data and seabed disturbance (of PMFs)

There is no specific [EUNIS habitat classification](#) for the proposed sea farm site. From sea chart information it is likely to be A5.25 Circalittoral fine sand or A5.26 Circalittoral muddy sand. The anchor layout of the farm will be deliberately 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 proposed 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 7).

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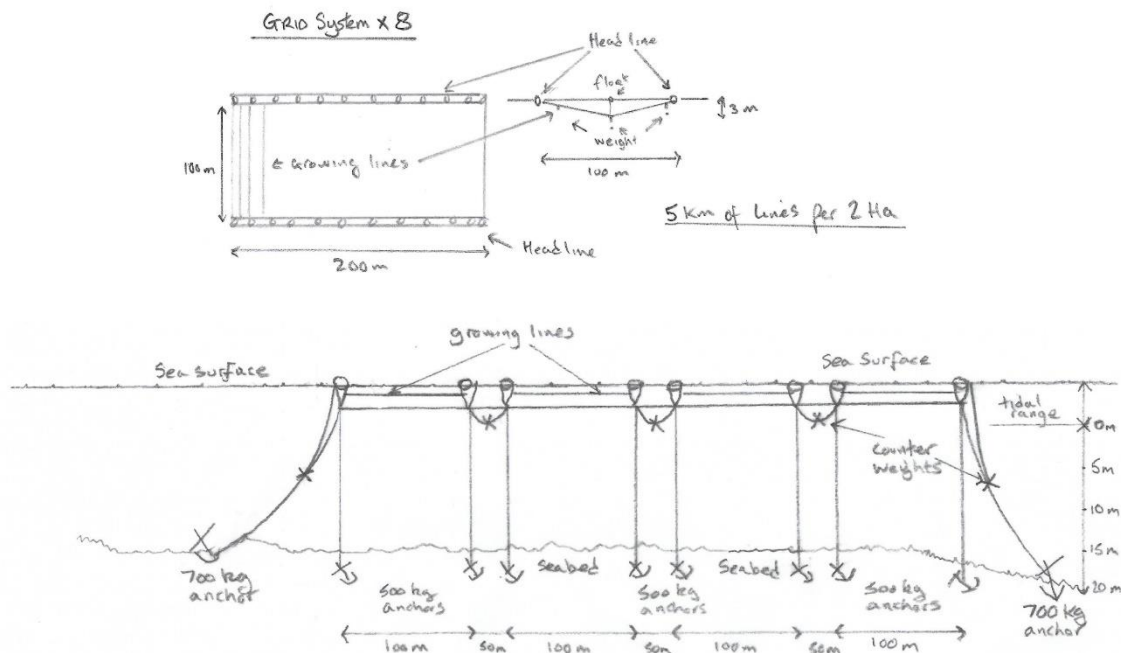


Fig 7 - Loch Bay seaweed farm layout.

The tall sea pen (*funiculina quadrangularis*), flame shell (*limaria hians*) and horse mussel (*modiolus modiolus*) are Priority Marine Feature (PMFs) species as are maerl beds, which are habitat forming deposits of red seaweeds as soft corals. All have been observed in the area of Loch Bay, but not directly within the boundaries of the Loch Bay sea farm LOA, but it is highly probable that they do exist within the farm area. Kaly 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

[Redacted]

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[Redacted]

07.09 development phase disturbance

Our development phase at each 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 140m from the High tide mark. Cables strung from these anchors head directly away from the shore to surface structures, the nearest of which will be from the High tide mark.

[Redacted]

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[Redacted]

No works that are proposed will fall within the minimum 30m exclusion zone. The minimum distance from the Mean Low Water Spring (MLWS) is 135m and distance to Mean High Water Spring (MHWS) is 200m to avoid encroaching into the shoreline area.

[Redacted]

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. [Redacted]

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).

[Redacted]

07.12 Shorelines of proposed Seaweed Farm

[Redacted]

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[Redacted]

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. Kaly'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 Kaly Biosecurity Plan

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

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.

Kaly have based their Biosecurity Plan around such publications as Nature Scots' Commissioned report - [Marine biosecurity Planning](#). Kaly will lay out each part of their proposed 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 Kaly's farm and seed stock taken from the Skye 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 Kaly staff and contractors will be trained in INNS recognition via ID cards placed on vessels, shore bases and at the Kaly'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**

08.02 The Farm Site

The proposed site of the Seaweed Farm in Loch Bay is 1 nm from the nearest habitation on the Skye coastline. As such the site is well away from any direct sewage or chemical outputs from direct source pollution.

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Kaly 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 Kaly's processing facility will find its way back into the sea. **Low Risk**

08.03 Seaweed Species

The main species Kaly 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 Skye coast. No seaweed stock will be brought in from outwith the Skye coastal area. All seed stock will be collected from rocky shores near the Loch Bay farm site.

All laboratories that Kaly 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 Kaly'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 Loch Bay 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 Kaly 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.

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

Kaly intend to cultivate several native species at the Loch Bay site. Three main target seaweed cultivation species Atlantic wakame (*alaria esculenta*), oar weed (*laminaria digitata*) and sugar

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kelp (*saccharina latissima*) are large brown seaweeds or kelps found on lower littoral and sub-littoral rocks exposed to strong wave action across the Skye 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 Skye coast. At the moment they are mostly harvested but the technology to cultivate them is developing. Kaly 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 will be very small, a standard bucket of fertile seaweed could nurture 20km worth of seeded farm growing line which could produce over 150 tonnes of mature seaweeds.

The species to be farmed 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 Kaly 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 will occur 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 will be deployed by existing small creel vessels or local 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 will be harvested of the resulting seaweed growth between late March through to Late May. 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 Skye coast and work locally. They will 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 will be stored out of the water when not in use, their hulls washed in fresh water each time they are retrieved.

Low Risk

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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 will be washed down at site with seawater hoses. All equipment and ropes brought ashore will be washed thoroughly with fresh water and stored ashore. **Low Risk**

08.08 Onward Processing

To keep the seaweed to the highest standard the product needs to be brought ashore and loaded onto temperature controlled vehicles, then to be 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, Kaly will ensure that all harvest taken from the farm site will be washed onshore in fresh water at their processing Hub on Skye 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 Kaly'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 Kaly'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.

Kaly 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 tries 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.