



MARINE (SCOTLAND) ACT 2010, PART 4 MARINE LICENSING

BEST PRACTICABLE ENVIRONMENTAL OPTION (BPEO) ASSESSMENT: DISCHARGE OF FISH FARM CHEMICAL TREATMENT AGENTS AT MARINE HARVEST (SCOTLAND) Ltd.

1. Introduction

1.1 Background to application

This Best Practicable Environmental Option Assessment BPEO is to support a sea disposal application under the Marine (Scotland) Act 2010. The aim is to obtain permission to discharge sea lice treatments from wellboats in waters adjacent to fish farm sites. This BPEO will cover all sea water fish farms which are operated by MHS and further details of these farms will be submitted along with applications for wellboat discharge. Wellboat discharge of medicinal treatment at the cage edge will comply with SEPA environmental quality standards (EQS) developed as part of the controlled activities regulations.

Wellboat treatments are considered in-line with Scotland's National Marine Plan. The primary objectives which wellboat treatments meet are those of reducing environmental impact and improving industry sustainability. This is done by reducing sea-lice pressures by using a methodology which is both efficient and also complies with all environmental limits. Marine Harvest now favours the use of non-medicinal treatments where practical, and the company has been particularly successful in utilising Cleanerfish as a means of biological control. Wellboat treatments are considered as a backup solution to cleanerfish and other non-medicinal measures. Marine Harvest is investing heavily into mechanisms for freshwater treatments as another tool to reduce reliance on medicines.

Bath treatments are an alternative to in-feed treatments. The hydrographic and climatic conditions, the large number of pens, their large size and the large number of fish involved make tarpaulin treatments technically and logistically difficult at many sites. Furthermore, as seawater temperatures increase, it becomes riskier to keep fish in enclosed volumes without optimum control of oxygen levels. Wellboats are an effective alternative to tarpaulin treatments and will be employed on a case and site specific basis when deemed necessary by the company health team. Wellboats are the best possible alternative to tarpaulin treatments to ensure efficient sea lice control and preserve fish welfare.

1.2 Source of materials

Medicine:	Materials are manufactured by:
Excis (Active ingredient Cypermethrin)	Vericore Ltd, Kinnoul Road, Kingsway West, Dundee
AMX (Active ingredient Deltamethrin)	Pharmaq AS, Skogmo Industriomrade, N-7863 Overhalla, Norway
Salmosan Vet(Active ingredient Azamethiphos)	Novartis Animal Health UK Ltd, Whittlesford, Cambridge
Salmosan (Active ingredient Azamethiphos)	Novartis Animal Health UK Ltd, Whittlesford, Cambridge

Azasure (Active ingredient Azamethiphos)	Neptune Pharma Limited, 145-157 St John Street, London, EC1V 4PW
Hydrogen Peroxide (Used in 30% solution)	Solvay Chemicals Ltd, Baronet Road, Solvay House, Warrington

With the exception of Hydrogen Peroxide, all of the above are prescription medicines and can only be used where prescribed by a vet. All MH's sites carry licences for the necessary treatment agents and their use is regulated through the use of modelling and monitoring. SEPA grant licence, under the Controlled Activities Regulations (CAR), to discharge various medicines based on precautionary environmental quality standards. All chemicals are licensed in the UK.

1.3 Description of materials

Please refer to the attached substance data sheets for AMX, Excis, Paramove (hydrogen peroxide) and Salmosan/Salmosan Vet/Azasure.

1.4 Details of previous, related operations including current practice

Marine Harvest routinely uses various medicinal bath treatments on site where deemed necessary by the Marine Harvest health team. Marine Harvest has SEPA consent (under the CAR regime) for all of the medicines we intend to use in wellboat operations (AMX, Excis, Paramove and Salmosan/Salmosan Vet/Azasure) and on site records are kept for all treatments. Area Management Agreement principals will be followed on sites to synchronise treatments, fallows and site stocking.

2. Discussion of Available Disposal Options

2.1 Land discharge via an outfall

The volumes of water make land discharge practically and technically unfeasible as waste would need to be pumped ashore and then treated on land. Depths of waters close to the shore don't allow large vessels such as wellboats to come inshore.

2.2 Sea disposal

Treatment agents discharged into the marine environment are quickly diluted, dispersed and broken down into harmless compounds; this makes sea disposal by far the most environmentally and technically sensible option.

2.2.1 Fish farm cages via CAR consent using tarpaulins

Tarpaulin treatments only allow a limited number of cages to be treated per day:

- Weather conditions are much more restrictive with tarpaulins (waves, wind)
- Furthermore, especially with rising sea temperatures and large fish size, it is very difficult to maintain adequate oxygen levels in the water. The risk of fish mortality is increased

significantly when using tarpaulins.

2.2.2 Fish farm cages via Marine licence

Wellboats are an environmentally and technically sound alternative to tarpaulin treatments as they provide a very controlled environment for bath treatments. It is possible to treat a higher tonnage of fish in a wellboat treatment than it would be in a tarpaulin treatment of the same water volume. This means that overall there is less chemical agent required for the treatment of the whole site. The treatment effluent can be discharged at a slower rate when compared to the instantaneous discharge of tarpaulins. This factor means that dispersion is spread out over a longer period of time which aids the assimilative capacity of the environment.

2.2.3 Location other than at fish farm cages

n/a

2.3.4 Pre-treatment options prior to discharge at sea

There are no known pre-treatment options. All proposed medicinal treatments have low water solubility and degrade rapidly. They bind strongly to organic particles and other solids, and it is rapidly adsorbed by sediments, reducing its biological availability and hence its toxicity to benthic organisms. Agents released following a bath treatment will be rapidly diluted in the receiving environment and the majority will be adsorbed onto particulate material, which will settle to the seabed.

3. Aspects to be taken into Consideration

3.1 Strategic considerations

3.1.1 Operational aspects, including handling, transport etc

Treatments are administered following veterinary approval and are done in-line with area management agreement principals and the SSPO code of good practice. The SOP for wellboat treatments is attached to this document.

3.1.2 Availability of suitable sites/facilities

If treatment of fish is deemed necessary according to the thresholds set out within the SSPO Code of Good Practice then the site will need to undergo medicinal treatment. If deemed appropriate Marine Harvest will arrange a visit from a wellboat operated by Norwegian company Solvstrans. This vessel will visit the site and then carry out the treatment operation.

3.1.3 Legislative implications, both national and international

Marine licence sought.

3.1.4 Summary of the outcome of discussions with third parties (If possible, copies of consultees replies should be appended to the assessment)

There have been no formal discussions with third parties. Most sites operated by Marine

Harvest are part of an Area Management Agreement. Those which are not operate as though they were part of one and maintain area management principals to mitigate disease risks.

3.2 Environmental considerations

3.2.1 Safety implications

Please see attached safety data sheets.

3.2.2 Public health implications

The only Public Health implication identified relates to food safety, with consumption of medicated fish. With the mentioned prescription medicines, all treated fish undergo a withdrawal period (10 days) prior to slaughter. Farming traceability system ensures this period is adhered to prior to harvesting. Wellboat treatment and discharge will have no impact on shellfish farms.

3.2.3 Pollution/contamination implications, including discussion on: accumulation, toxicity, hazards, persistence, short and long-term impacts, dilution and dispersion, etc

The quantities of medicine used in well boat treatments will typically be less than those used in tarpaulin treatments. Discharges from wellboats will allow more efficient dispersal of treatment agents as discharges are spread over a period of time rather than the instantaneous discharge from tarpaulin treatments.

3.2.4 Interference with other activities, e.g. fishing operations, other aquaculture interests, recreation etc.

Marine Harvest fish farms are part of area management agreements (AMA) where possible. Those which are not part of AMA's are operated as though they were in order to minimise interference with other fish interests.

The purpose of an AMA is to voluntarily promote and implement measures for the maintenance of healthy stocks of wild and farmed salmonid fish in the geographical area. An Area Management Group (AMG) includes representatives of each fish farming company present within the area and also includes input from of wild fisheries representatives.

Each company strives to achieve a lice burden of zero ovigerous females, particularly between the periods from February to June.

Each company seeks to coordinate lice treatments with all neighbouring farms within the individual management areas. This is done with the aim of maximising the benefits of anti-lice treatments and preventing cross-contamination of lice between farm sites.

There will be full recording and documentation of measures taken to control lice on farms. This documentation is available to all members within each management area to allow more effective control of disease and lice problems.

3.2.5 Amenity/aesthetic implications

The only aesthetic implication of wellboat treatment is the visual appearance of the wellboat itself. As treatments are likely to be relatively infrequent the aesthetic implications will be minimal.

3.2.6 Best practice guidance and mitigation measures

A wellboat gives a much more controlled environment for the administration of medicinal treatments than in-cage tarpaulin treatment. The discontinuous nature of the discharge and the mobility of the vessel it is possible to discharge at precise times (taking tides into consideration) or at precise locations. Fish well-being is also less at risk in a boat.

3.3 Cost considerations

3.3.1 Capital costs, e.g. site costs, transport hire/purchase costs, equipment hire/purchase costs etc.

- Capital cost: None
- Hire cost:
Hiring a large vessel comes at a cost of over £3,200 per 24 hours.
Tarpaulins require buying oxygen and renting diffusion systems (approx. £2,000).
- Purchase:
Chemical cost is usually less when using a wellboat as treatments can be more precisely administered so less chemical is required to treat the same number of fish.

3.3.2 Operating costs, e.g. labour costs, site operation costs, transport costs, equipment costs, environmental monitoring costs etc.

- Operating costs are unchanged
- Labour cost remains unchanged.

4. Alternative methods

4.1 Cleanerfish

Marine Harvest considers cleanerfish to be an extremely important part of the salmon farming industry's future. The term "cleanerfish" encompasses fish, typically wrasse and lump suckers, that provide a service to other fish species, such as the removal of parasites. The Scottish Salmon industry is increasingly stocking cleanerfish in marine salmon farms and they have proven effective in, reducing sea lice numbers, and significantly reducing the need for medicinal treatments. In order to supply Marine Harvest's numerous seawater sites it is essential to develop a facility with capacity to rear a significant output of farmed cleanerfish stock. The company is investing £6million towards the development of cleanerfish including a hatchery facility in Argyll.

4.2 Freshwater treatment

MH has also invested in a new wellboat specifically designed to undertake freshwater treatments at seawater farms, the wellboat will be delivered in 2016. MH is in the process of applying for abstraction licences for a number of lochs to allow freshwater to be used for sea lice treatments. Sea water will be stored in specially modified pens to ensure sufficient quantities are available for treatment.

4.3 Hydrolicer

MH has invested heavily in researching the potential of mechanical removal of lice from salmon and as such has been operating a prototype twin Hydrolicer unit which is fitted to the deck of a workboat. The system works by using pressurised seawater to dislodge sealice from the salmon without any detrimental impact on the fish. Results achieved have been such that MH have invested in a second Hydrolicer unit.

4.4 Thermolicer

A second device, a Thermolicer has also been identified as a good option for mechanical lice control. A Thermolicer works by exposing the fish to lukewarm water which dislodges sea lice due to their low tolerance to sudden changes in temperature.

5. Conclusions

5.1 Summary of available options

The only two options available for bath medicinal treatments at fish farms are tarpaulin treatments at the cages or wellboat treatment and discharge. Bath treatment and discharge at cages is currently regulated by SEPA as part of the CAR licensing regime. Discharge from wellboats will have the same, or lesser, impact on the environment than tarpaulin treatments and will closely follow the precautionary standards applied by the Controlled Activities Regulations. The non-medicinal lice control methods are deployment of cleanerfish to the pens, freshwater treatment, hydrolicer and thermolicer.

5.2 Summary of pros and cons of each option

The following table represents a situation in which wellboat treatment is the best environmental option. It is worth noting that at some sites and under certain circumstances, Tarpaulin treatment may be a more sensible option due to bathymetry of site or other technical or environmental constraints. If Marine Harvest has consent to discharge from wellboats then we can ensure that the best option is used for each individual treatment.

Options	Cost	Chemical usage	Technical difficulty	Logistics	Environmental impact	Treatment efficacy	Risk to livestock	Strategic acceptability
Tarpaulins – CAR consent	High	High	Very labour intensive.	Weather and tidal restrictions apply	Moderate	Good	Very high	n/a
Wellboat – Marine consent	High	Moderate	Less labour intensive and more efficient	Boat availability and size are the only restrictions	Low	Good	Moderate to High	n/a
Cleanerfish	Moderate	None	High level of for-planning required	Production of efficient number of cleanerfish, transportation of the fish	Low	Good	Low	n/a
Freshwater	Moderate	None	Finding and storing supplies	Freshwater abstraction licences and boat availability	Low	Good	Low	n/a
Hydrolicer	Moderate	None	Less labour intensive and more efficient	Boat availability	Low	Good	Low	n/a
Thermolicer	Moderate	None	Less labour intensive and more efficient	Boat availability	Low	Good	Low	n/a

5.3 Identification of BPEO

It seems clear that discharge from a vessel, in some cases, is the best option when one considers environmental impact, chemical usage and fish welfare. Decisions on whether to use tarpaulin or wellboat treatments will depend on site bathymetry, wellboat availability, site currents and various other technical and environmental factors.