

PROCESS DESCRIPTION

For the purposes of this guideline, ‘aquaculture’ has been categorised as the farming of freshwater and saltwater organisms including molluscs, crustaceans and aquatic plants.

Specifically this includes:

- Farming of salmon, trout, eels or other freshwater fish for consumption;
- Farming fish for restocking;
- Freshwater farming of crayfish and freshwater mussels;
- Operating finfish hatcheries and growing fingerlings and fry from eggs;
- Farming salmon, sea trout, halibut, cod, haddock, plaice, sole or other species in coastal waters;
- Farming seaweeds (e.g. kelps);
- Marine farm mussels, scallops, oysters and clams; and
- Cultivating shellfish in enclosed water re-circulation system.

KEY ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Aquaculture can have a number of impacts on the environment. However, these impacts are dependant on the connectivity and associated pathways to the surrounding environment. Pond

systems used in onshore facilities can be separated through treatment/isolation mechanisms from the natural environment. However, aquaculture facilities in open water are exposed to the surrounding environment and isolation techniques are restricted.

Aquaculture Facility Development and Natural Habitat Loss

The installation or construction of an aquaculture facility may result in the direct loss of natural/native habitat, (e.g. the removal or alteration of habitat through the development footprint of the facility).

Most new or extended aquaculture sites will require an Environment Impact Assessment (EIA), especially those in EU States.

Depending on the nature conservation status of the proposed site and adjacent area there may also be implications under other EU Laws on the conservation of flora and fauna.

Wastewater Release/Discharge

Wastewater released into the surrounding waters (freshwater or marine) from aquaculture facilities can typically result in the discharge of a variety of pollutants or high concentrations of contaminants including:

- Elevated levels of sediment. The release of such materials causes deposition of organic nutrients from faeces and uneaten food can result in a detrimental impact on water quality. Consequently this can have a number of adverse impacts on the species being farmed

and other freshwater/marine fauna and flora in the area;

- High intensity aquaculture activities can rapidly result in the decrease of dissolved oxygen levels in the waters, potentially harming wildlife;
- Cleaning agents (including chlorine bleaches), chemical residues (including feed supplements, antibiotics and antifoulants); and
- Contamination of groundwater and surface water as a result of the release of effluents or release of process waters from ponds and lagoons.

Aquaculture activities may be subject to monitoring and possible enforcement action to ensure that they meet emission standards.

The EU Water Framework Directive 2000/60/EC require aquaculture facilities to meet the environmental objectives for the ecological and chemical status of surface waters by 2015.

Biodiversity Impacts

Depending on the scale and location of the aquaculture facility, a number of impacts on biodiversity are possible. Escapes from poorly maintained facilities or those facilities damaged in extreme weather can cause significant environmental impacts. These impacts are particularly significant on spawning grounds. Non-native organisms or genetically altered escapees can:

- Disturb and interfere with the existing natural ecological system;

- Out compete native wild fish for food and territory;
- Dilute the wild genetic stocks through interbreeding;
- Result in the diffusion and spread of fish disease (e.g. bacteria, virus, sea lice); and
- Displace eggs of the native species.

In addition, the aquaculture industry may introduce predator control techniques which may impact the existing natural ecological balance.

There may be laws in place to restrict the spread of diseases and protect the welfare of fish. Some of those relating to the EU are shown below:

- Directive 91/67/EEC concerns animal health conditions governing placing on the market of aquaculture animals and products;
- Directive 93/53/EEC introduced minimum measures for control of certain fish diseases;
- Directive 95/70/EC introduced minimum measures for the control of certain diseases affecting bivalve molluscs;
- Directive 2006/88/EC on animal health requirements for aquaculture animals and products thereof, and on the prevention and control of certain diseases in aquatic animals.



Sub-sectoral Environmental and Social Guidelines: Aquaculture (Marine and Freshwater) – Onshore and Offshore

Disposal of Solid Wastes

Aquaculture does not typically produce large quantities of solid waste, however key solid waste arisings are derived from dead fish and packaging.

The disposal of dead fish or shellfish from aquaculture activities must meet the requirements of the governing body and any associated regulations, which may control the collection, transport, storage, handling, processing, use and disposal of animal carcasses or parts of animal carcasses.

Land Contamination

Land pollution incidents from the aquaculture industry or previous land uses may include chemical, fuel or oil spills, which may have resulted in chemicals seeping into the associated land. In addition, any land may have become contaminated by previous owners, burying associated waste. These waste products and residues could present a hazard to both the environment and human health.

Heavy Lifting

Lifting, repetitive work and posture injuries can occur as a result of occupational requirements (e.g. refilling feeders, checking of nets). Repetitive tasks can lead to musculoskeletal injuries.

Electric Shock

The use of electrical devices in the aquaculture process (e.g. pumping facilities, lighting operations and water circulation systems) means that the risk of electrical shock is present during a variety of operations.

Drowning

By its very nature, the risk of drowning is present in all aquaculture operations and this risk is heightened with cage aquaculture operations at sea and when working in confined spaces.

Slips and Trips

The dependence on a water/wet environment in aquaculture means that there is a high risk of slips, trips and falls.

Waterborne/Insectborne Disease

Aquaculture workers may be subject to exposure to a variety of water borne diseases (e.g. leptospirosis) or insectborne disease (particularly in hot/warm climates).

Pollution Impacts affecting Consumption

Aquaculture facilities provide the opportunity for farmed species to bio-accumulate inorganic compounds. This in turn may affect the ability for future consumption.

OTHER ENVIRONMENTAL, HEALTH AND SAFETY RISK/LIABILITY ISSUES

Water Consumption

Water resources utilised in the aquaculture process includes sea, estuaries, rivers, lakes, ponds and groundwater. It is typical for abstraction or water use permits to detail volumes of water abstraction allowed as over abstraction can impact local communities. Where ever changes take place in product volumes this should be reflected in the permit.



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Odour

Although odour is not as problematic as in fish processing plants, aquaculture facilities can generate strong odours and, depending on the location of the facility, odour can potentially be a significant nuisance issue for neighbouring facilities and residential areas.

Noise

Noise generation from aquaculture systems are generally low, however the process can result in localised impacts resulting directly from the type and form of generators and/or water circulation/filtration systems employed.

Energy Consumption

Where equipment is being used for heating, cooling, filtration or circulation purposes it will increase the amount of energy (gas, electric, or diesel) use within the processes. Energy usage has a direct correlation to the operating costs of the company. Levies or taxes may be applied to minimise energy use and emissions of carbon dioxide.

Energy reduction programmes/legislation may require substantial investment in new/clean technologies to achieve the emission targets set.

Refrigerants

Refrigerants used at aquaculture facilities are likely to be either ozone-depleting chemicals (principally chlorofluorocarbons) and/or ammonia. Providing the refrigeration systems are well maintained these materials should remain within a sealed system and would therefore pose little environmental threat.

Release of these compounds into the atmosphere, however, would be expected to result in damage to the local and global environment.

Air Emissions

With the exception of odours, air emissions are unlikely to be a principal cause of concern in relation to the operation of aquaculture facilities. However, the operation of pumps, water filtration and circulation units have the potential for creation of atmospheric emission problems relating to organic compounds and particulates.

Materials Storage

Materials stored and used at aquaculture facilities have the potential to impact human health and the environment. The most significant of these materials are likely to be:

- Bleaches and cleaning fluids;
- Oils and greases; and
- Fuels.

Chemical Exposure

The variety of chemicals used in the aquaculture process leads to the potential exposure to a range of hazardous substances.

KEY SOCIAL, LABOUR, AND COMMUNITY RISK/LIABILITY ISSUES

Loss of Biodiversity

Loss of biodiversity due to the impacts of aquaculture can impact local and indigenous

communities who are dependent on these species for their livelihoods.

FINANCIAL IMPLCATIONS

In most areas, effluent and waste discharge has direct financial implications for the aquaculture facility through:

- Fees for discharge licences and permits;
- Monitoring costs;
- Fines and penalties for negative environmental impacts or breaches of permit limits.

Companies may need to spend considerable sums in order to achieve acceptable effluent discharge quality and to meet the appropriate water quality standards.

The principal financial issues associated with water supply are the direct costs of supply (payment to water suppliers, costs of abstraction from groundwater or surface water bodies, sampling and analytical costs).

Fish and fish products can be contaminated at source. The potential exists for substantial liabilities to be incurred by the aquaculture facility. Typically, the liabilities take the following forms:

- Civil liabilities resulting in compensation claims from injured parties;
- Criminal liabilities, usually resulting from some form of negligence, resulting in fines and prohibitions;

- Diminished reputation and sales as a result of damage to public perception of the company and/or the industry as a whole;
- The raw water may be subject to pre-treatment requirements which require capital for equipment and higher operating costs to pre-treat water;
- If a wastewater treatment plant is not present there may be pressures from the regulatory authorities for one to be installed. If the site has wastewater treatment facilities it may be required to be upgraded to meet stricter discharge parameters. This is likely to incur significant costs. The level of fines or fees in relation to wastewater discharges should also be assessed;
- Where large quantities of energy are being used within the process this can result in high operating costs to the business;
- Capital expenditure might be required to maintain health, safety and hygiene standards;
- Injuries may lead to increased payroll costs to replaced skilled workers;
- Depending on the location of the facility and the surrounding land use, financial liabilities relating to odour may be a factor for aquaculture facilities. Odour control equipment can prove costly and improvements to waste management and storage procedures may provide substantial improvements to odour emissions for relatively limited costs; and

- Fines, penalties and third party claims may be incurred for non-compliance with the relevant environment, health & safety regulations.

IMPROVEMENTS

Environment Improvements

Potential environmental improvements may include:

- Installation/improvement of the wastewater/effluent monitoring and treatment facilities;
- Monitoring of adjacent waters with regard to quality and biodiversity;
- Monitoring of feed types and quantity of feed consumed to minimise nutrient loading of the surrounding environment;
- Minimise the use of 'fine' feed;
- Installation of grids to reduce or avoid introduction of solid materials into the waste water drainage or natural system;
- Implementation of a waste minimisation and management system, for residual wastes;
- Potential for reuse of wastewater through recycling, thus minimising final wastewater volumes;
- Installation of screens with a suitable mesh/net to prevent the access/egress of aquatic species;
- Insulate any refrigeration rooms;

- Screening of raw materials and water used in the process for potential contaminants;
- Installation of equipment to clear air emissions of odour;
- The upgrade of storage areas of all raw materials, casings and solvents to allow for proper containment of accidental spills and leakages;
- Regular integrity testing of underground storage tanks and bulk storage tanks to reduce potential for pollution and accident/fire/explosion precautions and emergency procedures;
- Changes to non-CFC coolants and/or sealing of leakages in the refrigeration system;
- Ensure that packaging is either recovered or capable of being recycled.

Health & Safety Improvements

- Isolate all electrical installations and ensure these are waterproofed;
- Separation of people from moving/hazardous equipment;
- Install mechanical lifting aids where possible and rotate work tasks to reduce repetitive activities;
- Provide appropriate training to all personnel involved in activities associated with electrical equipment handling;

- Install correct guarding of machinery to reduce risk of entrapment of employees;
- Install walkways to separate people from vehicle movements to reduce risk of collision;
- Maintain walking areas to ensure they are clean and dry/non slip (where possible);
- To reduce the risk of noise exposure by isolation or insulation of a noisy process and rotate tasks to minimise time spent in a noisy area over an eight hour period and provide personal protective equipment where people have to enter noisy areas;
- Restrict times for people being in very cold or very hot areas;
- Restrict access to working at height. Ensure correct fall arrest systems are in place, such as, (guarding and harnesses);
- Access to confined spaces such as cages or storage areas should be restricted and correct procedures should be implemented to ensure that risks from entering confined spaces are reduced;
- Upgrade storage arrangements to ensure leaks do not occur;
- Use of personal protective equipment (PPE) to protect employees and visitors from identified Health & Safety hazard. Specific PPE provided (e.g. lifejackets and harnesses with safety clips that lock on to lines or fixed points);
- Provide personal protective equipment to maintain hygiene standards. Personal protective equipment should be fit for purpose and personnel should be trained in its correct selection, use and maintenance;
- Train personnel in working near water requirements and associated rescue procedures.

GUIDE TO INITIAL DUE DILLIGENCE SITE VISITS

During the initial site visit, the issues will vary according to the type of aquaculture facility and the type of product being farmed or produced and depending on the level of environment, health & safety management already introduced. While visiting the site it is important to discuss and review the following:

- Permitting requirements and the presence/duration of appropriate permits;
- Any history of breaches of statutory or regulatory requirements;
- Statutory or other land use restrictions/requirements (particularly for new plants);
- The surrounding land/water uses and the potential for impacts associated with these uses;
- The sources, quality and nature of raw materials (including water) used in the site processes; and means of protecting the source;
- Aquaculture facilities should have evidence, such as manufacturers specifications, to

support that the pens/nets used are suitable for the environment in which they are to be used;

- Particular attention should be paid to the design, mooring and resilience of pens to be used in more exposed, higher energy environments such as those found in offshore/coastal waters;
- Pens, nets and moorings should be inspected on a regular basis as part of a planned maintenance schedule and repaired/replaced as soon as damage/wear is noted. Such inspections should be recorded and available for scrutiny;
- Check stocking densities versus mortality rate is average for the sector
- Any noticeable odours and air emissions, what is the zone of influence of these odours/emissions?
- The condition and quality of materials storage facilities for raw materials, caustics and chemical solvents (including underground storage tanks) typical indicators of spillage include leaking pipes and stained ground;
- Waste management and disposal procedures (in particular in relation to effluent processing and discharge) and any associated effluent monitoring data;
- Are there any designated sites or protected species/habitats in close proximity or linked (e.g. through an environmental pathway) to the existing or proposed aquaculture facility?
- Could any designated sites or protected habitats/species be impacted on by the existing or proposed aquaculture facility?
- Screening methods to prevent contamination of raw materials and the finished product;
- What is the standard of “house-keeping” on site? Do areas look clean and tidy? Look for localised spills, leaking pipes, stained ground etc;
- Check that solid waste storage and disposal (storage equipment) is in a good condition;
- Check that waste storage areas are clean of debris and that skips are covered to prevent waste escaping, for example, check that waste containers have lids or are stored in an area with a roof;
- Check whether people are wearing personal protective equipment and determine the availability of such equipment;
- Any history of public complaints relating to the facilities operation;
- Check the age and condition of buildings and equipment;
- Check the signage around the site, does it convey what health & safety risks might exist in areas?
- Is fire fighting and first aid equipment available?

- Check that wages and working hours are consistent with the average for the sector and national standards;
 - Is the facility next to any industries which may pollute ground water used in the process?
 - Does the organisation have insurance in place to cover the recall of contaminated products? Have there been any recent product recall incidents?
 - Have there been any recent (within the last three years) incidents on site such as fatalities, fires/explosions, spills?
 - Is the facility subject to any audits by customers? What was the outcome of these audits?
 - Are there any habitat restoration schemes that the aquaculture facility could assist to offset any detrimental impacts of its operations?
 - Does the business plan have line items for Environment, Health and Safety improvements?
 - Are the aquaculture facilities adequately marked to prevent collision with mariners/shipping/boats? and
 - Have appropriate security measures where there is a possibility of malicious damage and/or deliberate release of fish from the aquaculture facility?
 - Check that labour standards, contracting and remuneration are in line with national law and are consistent with the average for the sector.
 - Check that hours worked, including overtime, are recorded and staff should receive written details of hours worked and payment received.
 - Has the Company received inspections from the local labour inspectorate in the previous three years? Have these resulted in any penalties, fines, major recommendations or corrective action plans?
 - Does the organisation have a grievance mechanism which allows employees to raise workplace concerns?
 - Are employees free to form, or join, a worker's organisation of their choosing?
- Take note/ask questions relating to any activities that address the improvements listed in the improvements section of this document.
- It should be recognised that plant operation may be seasonal and visits should be timed accordingly.

ACTION PLANS

Dependent on the individual business, select appropriate improvements from the list above to include in the action plan. As a minimum any business should be required to have the following in place:

- Operational procedures to manage environmental, health & safety risks;

- Monitoring programmes;
- Improvement objectives, targets and project plans;
- A training plan for personnel to include environmental and health and safety issues;
- Regular inspections, checks and audits with records to demonstrate achievement of the required level of performance against legal requirements, permits and improvement action;
- Emergency plans for environment, health & safety accidents;
- Management review/demonstrated involvement in environment, health & safety management.

Aquaculture facilities should have a specific Environmental Management Plan that includes plans for monitoring and improving the following:

- Surrounding water quality;
- Prevention of escapes;
- Organic waste reduction and/or remediation;
- Use of chemicals and medicines;
- Protection of biodiversity;
- Control of predators;
- Biological oxygen demands;
- Prevention and control of disease (e.g. sea lice), including transfer to wild stocks.

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