Finfish Aquaculture Waste Control Regulation
Policy Intentions Paper for Consultation

1. Introduction

The Ministry of Environment ("the ministry") is presently reviewing the Finfish Aquaculture Waste Control Regulation of the *Environmental Management Act* (EMA) – with the goal of amending the regulation. This review is part of a process of continual improvement of the standards regulating the industry and is intended to draw on understanding of current finfish aquaculture industry practices and scientific knowledge gained in the past several years concerning wastes associated with the industry.

The *Environmental Management Act*, brought into force in July 2004, is the principal environmental statute governing waste discharges in British Columbia. The Act prohibits the introduction of waste into the environment in such a manner or quantity as to cause pollution, except in accordance with a regulation, permit, approval, or code of practice issued under the Act. The Finfish Aquaculture Waste Control Regulation, governing discharges of wastes to the environment from marine fish farm site operations, was enacted in September 2002 and replaced the former Aquaculture Waste Control Regulation.

The Finfish Aquaculture Waste Control Regulation governs discharges of wastes to the environment from marine fish farm site operations. It is intended to be "performance-based" – establishing compliance standards for specified environmental criteria (e.g., specific standards at set distances from a net pen array).

2. Ministry and Government Goals

The Ministry of Environment provides leadership in environmental management through innovative legislation and programs, compliance activities and shared stewardship initiatives. The ministry's mandate is to protect public health and safety, and maintain and restore the diversity of native species, ecosystems and habitats. The ministry is working to support the government's goals – to lead the world in sustainable management, with the best air and water quality, and the best fisheries management, bar none; to lead the way in North America in healthy living and physical fitness; and to create more jobs per capita than anywhere else in Canada.

The development and enactment of the *Environmental Management Act* and its associated regulations facilitates implementation of results-based regulations that provide clear roles for governments and stakeholders, consistent performance standards, updated fee structures, decreased remedial and legal costs, and a greater focus on those not in compliance with regulatory requirements.

Amendment of the Finfish Aquaculture Waste Control Regulation is intended to support protection of public health and the environment, good stewardship practices and effective compliance measures.

3. Background Information

3.1 The Finfish Aquaculture Waste Control Regulation

The regulation applies to all marine finfish aquaculture operations in British Columbia. It includes provisions for registration with the Ministry of Environment, waste discharge standards (including conditions for domestic sewage discharge), prestocking requirements, a Best Management Practices plan, monitoring and reporting, remediation, fees, offences and penalties. Finfish farm operators are required to meet chemical and biological standards in sediments at stations within, and at the perimeter of, the fish farm tenure at peak biomass conditions during each production cycle. Failure to meet the identified standards triggers other requirements, including fallowing of the farm site until sediment standards are met.

3.2 Regulation amendment process

The regulation review process consists of five phases:

1. **Scoping** – including a review of the regulation by a technical committee, commissioned assessments of specific technical issues and community meetings.
2. **Policy Intentions Paper for Consultation** (intentions paper) **–** outlining the ministry's proposed revisions for the regulation and any outstanding issues or questions.
3. **Consultation** – with affected stakeholders and the general public, using the intentions paper

and response forms posted on the ministry website, and other means as required.

4. **Drafting** – preparation of legal language for consideration by the Minister and Lieutenant Governor-in-Council.
5. **Implementation** – informing ministry staff and external stakeholders, and developing guidelines and/or best management practices.

The purpose of this intentions paper is to seek responses and comments from stakeholders and the public on the proposed revisions to the regulation. The paper provides: a summary of ministry and government goals; background information regarding the regulation of finfish aquaculture wastes; proposed revisions to the regulation; and information on the development of best management practices and assuring compliance. The paper also describes the avenues for providing comment on the proposed revisions.

The intentions paper and response form for providing comments to the ministry, and links to related legislation, are posted on the ministry's website: www.env.gov.bc.ca/epd/codes/index.htm.

Additional guidance documents and reports related to the regulation can be accessed from the Ministry of Environment home page, by following the Environmental Protection Division and industrial waste links, or by clicking on the address below: www.env.gov.bc.ca/epd/industrial/aquaculture/index.htm.

3.3 Review and scoping activities to date

In early 2005 the ministry established a technical committee to review the existing regulation and provide comment on potential issues and aspects of the regulation that would benefit from amendment. The committee included representatives from the Ministry of Environment, the Ministry of Agriculture and Lands, the Department of Fisheries and Oceans and the finfish aquaculture industry. Drawing on recommendations of the technical committee, the Ministry of Environment identified a number of aspects of the regulation for potential amendment and initiated scientific studies of several issues.

These included:

- Including hard seabed substrate compliance parameters in the regulation;
- Adopting an "ecological threshold" approach to monitoring and compliance standards;
- Clarifying intent and wording in the regulation to ensure clear communication of standards and associated requirements;
- Updating the associated Protocols for Marine Environmental Monitoring document; and
- Harmonizing regulatory requirements with those of other applicable ministries and federal agencies.

As a result of these studies, the ministry developed potential amendments to the regulation that then were reviewed by an independent peer review panel comprised of individuals with expertise in the field of aquaculture. The resulting proposed amendments are reviewed and discussed in detail in Section 4.

Reach of the Regulation

The scope of the review does not extend to such concerns as sea lice, fish escapes, fish health, land-based net washing, fish mortality disposal, mariculture (shellfish aquaculture) or site selection. These aspects of management and protection of human health and the environment fall under other federal, provincial and local government legislation and policies.

3.4 Community information meetings

The ministry hosted a series of community meetings in June and July 2007 as part of the scoping phase of the review. Meetings were held in Nanaimo, Prince Rupert, Campbell River, Tofino, Alert Bay and Port McNeill. The purpose of these meetings was to provide information on the current regulation and solicit early comments on potential changes to the regulation, as well as other waste management issues of concern. Comments were received regarding the issues identified in section 3.3 above, as well as additional areas of concern and suggestions identified by participants at the community meetings. A summary of these comments has been prepared by the ministry and is posted

on the ministry's Finfish Aquaculture Waste Control Regulation website.[1]

4. Proposed Revisions to the Regulation

4.1 Focus for proposed amendments

The ministry's focus for proposed revisions to the regulation is "near field" effects of organic enrichment on the ocean bottom (i.e., those in close proximity to farm sites). Proposed amendments to the regulation address: the sampling and monitoring of hard and soft bottom seabed substrates with updated protocols; harmonization of regulatory requirements with those of other applicable ministries and federal agencies; certification provisions and policy for data providers; and encouraging effective utilization of appropriate Best Management Practices to address other objectives (such as mortality disposal, fish kill contingency planning, wildlife attraction and harmful materials).

The goals of the proposed changes are to:

- Strengthen public confidence that the aquatic resources are being effectively managed and regulated in concert with sound ecological principles;
- Use the best current scientific knowledge and common sense for application of rules with respect to routine practices and environmental conditions; and
- Support good environmental management and sustainable practices.

The proposed changes address priorities identified by the aquaculture technical committee as part of the amendment process. The changes are based on the application of scientific principles using the most current research results and incorporation of an ecosystem-based management approach to management of finfish aquaculture wastes.

[1] See: www.env.gov.bc.ca/epd/industrial/regs/finfish/summary_mtgs_fawcr.htm

4.2 Issues not included in the proposed amendments

There are several important issues related to finfish aquaculture waste that are not included in the proposed revisions to the regulation. These include: assimilative capacities; cumulative effects; water quality; and far field effects (potential effects on the receiving environment beyond the immediate vicinity of the fish farm). These issues require further substantive scientific research prior to development of compliance standards. It is the intent of the ministry to address these issues over the next several years.

4.3 Development of initial standards for hard ocean bottom sites

The regulation does not presently include regulatory standards for hard ocean bottom fish farm sites. To address this gap, the ministry has undertaken technical contracts and field trials to: establish video generation specifications and deployment protocols; develop video classification protocols; develop compliance parameters; and determine an appropriate program for baseline and operational sampling and monitoring of hard ocean bottom sites. The information obtained from this work has resulted in several proposed changes to the regulation for hard ocean bottom farm sites as discussed below.

Following completion of these technical tasks, the regulation and accompanying guidance documentation will be amended to include standards for hard ocean bottom fish farm sites. In addition, the Protocols for Marine Environmental Monitoring (PMEM) will be updated to incorporate new protocols associated with the generation of hard ocean bottom compliance data. The protocols document outlines the technical procedures to be followed when generating baseline and operational monitoring data.

Video generation specifications and deployment protocols will include speed over ground, lighting, distance above ocean bottom and positioning. Substrate classification protocols will include the use of video quadrats at compliance points and video assessment based on a time unit basis.

The ministry is proposing that a "**zone of compliance**" 24 m in length (6 video time units at 4m/unit) be established starting 115 m from the edge of the net pen array. This zone will be used for assessing compliance with the regulatory standards. Compliance will be based on the assessment values for the majority of the units. A compliance zone, rather than a set point, is used: 1) because of the difficulty in knowing the exact position of a remotely operated vehicle at any point in time; and 2) because hard ocean bottom sites are typically heterogeneous in nature, resulting in a non-uniform build-up of organic material. A zone of compliance will provide a more representative assessment for monitoring and enforcement.

In association with the zone of compliance, the ministry is proposing two primary **parameters** for hard bottom ocean sites: 1) *Beggiatoa* (bacterial mat); and 2) opportunistic polychaete complexes (marine worms) which are typically found in areas of high organic build-up. For both parameters, the ministry is proposing that the percentage of cover (unit of measurement) must not exceed 10 per cent during peak biomass. If this maximum is exceeded, restocking would not be permitted until both parameters are below this 10 per cent level. The restocking standards are only applicable if the peak biomass standards are exceeded, triggering fallowing and pre-stock sampling requirements.

Monitoring programs for both baseline (pre-production) and operational (production) modes will incorporate the recommended regulatory parameters and associated standards.

4.4 Establishing an ecological threshold approach for soft ocean bottom sites

The current regulation sets out requirements for fish farms located over soft ocean bottom sites using the edge of tenure boundaries as compliance points. This approach is arbitrary and not science-based, as the size of tenures varies considerably. This leads to difficulties in establishing consistency in the level of environmental protection for government agencies and difficulties for fish farm operators to meet the regulatory standard.

The ministry is proposing a science-based ecological threshold approach – utilizing the relationship between the biological community and associated total free sulphides and a set distance from the net pen array – as the basis for compliance. The ecological threshold is defined as the point at which ecologically relevant change occurs, compared to background conditions, as measured by a chemical surrogate. Total free sulphides will continue to be used in the regulation as the surrogate measure of biological community presence. This information can be generated quickly and is less costly than the analysis of biological samples.

The validity of the ecological threshold approach was assessed through a review of historic sulphide and biological data generated by the ministry. This review confirmed that an ecological threshold approach to establishing **compliance locations** is scientifically valid and appropriate as a replacement for the present edge of tenure compliance location.

The ministry intends to continue using total free sulphide as the regulatory parameter for soft ocean bottom sites, with a proposed **concentration** of 700 uM $S^{=}$ (micromolar). The ministry proposes that the compliance sampling location be at a point 125 m from the edge of the net pen array.

Following scientific confirmation of the validity of the ecological threshold approach, the ministry has worked in partnership with the Department of Fisheries and Oceans (DFO) and the fish farm industry to develop and test the utility of predictive modeling as a tool in determining and locating the organic footprint of individual fish farms. Based on this work, the ministry has concluded that while predictive modeling supports understanding of fish farm operations, it is not appropriate for inclusion in the regulation for compliance purposes as modeling results may not represent actual conditions.

Based on the ministry's intention to use an ecological threshold approach, a series of related proposed changes to the present regulation and associated protocols document were triggered. These are discussed in the following sub-sections (A-D).

A. Establishment of fixed 30 m compliance stations

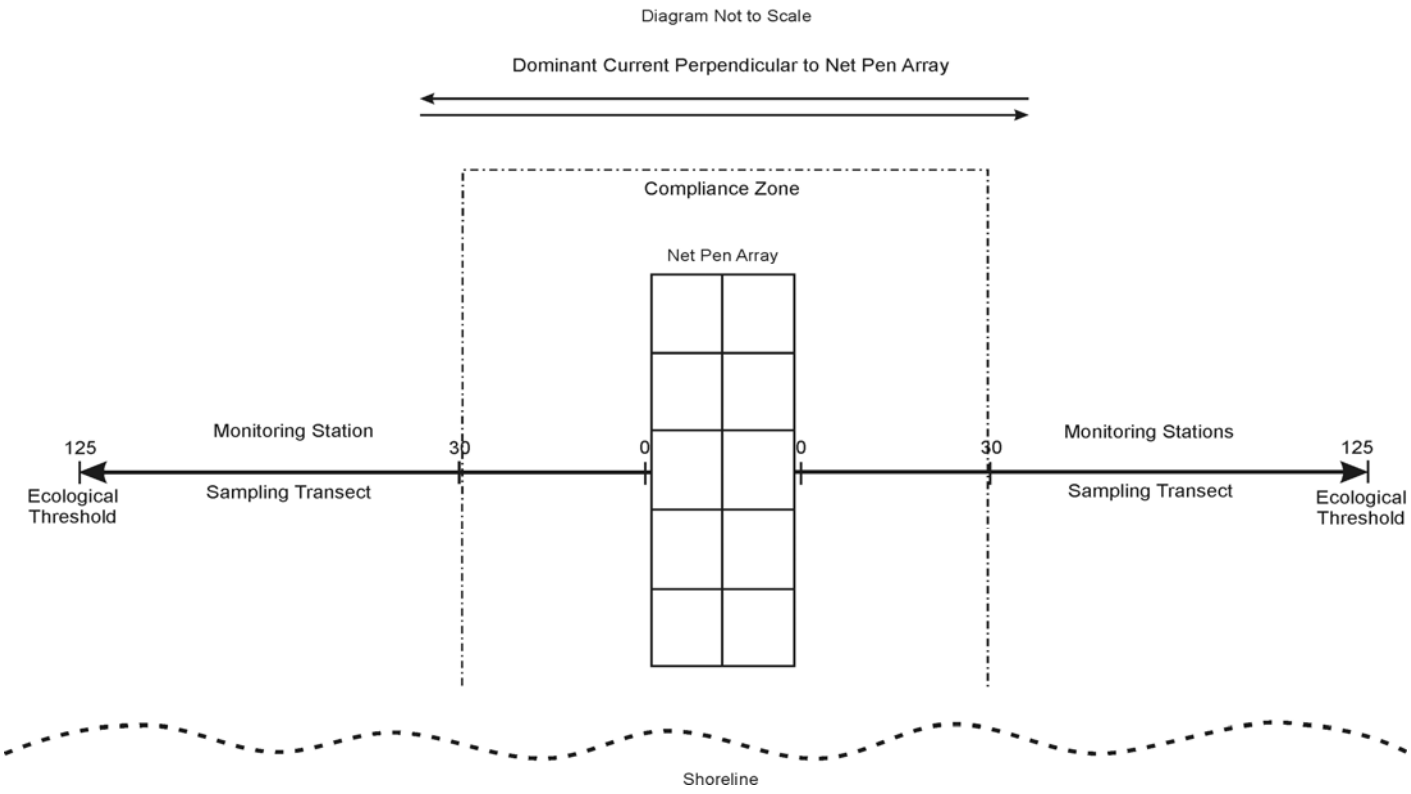
Net pen arrays can move up to 30 m along the principal axis with tidal cycles – limiting the utility of data for both farm management and compliance monitoring as there is no fixed data generation point. The ministry is proposing that fixed 30 m sampling locations be generated by obtaining differential GPS readings from each corner of the net pen array at high slack tide, followed by creating a 30 m offset from these readings through electronic mapping procedures. See figure 1 below.

B. Determination of utility of 0 m and 30 m monitoring stations and associated parameters

The existing regulation requires monitoring of free sulphide, redox (oxidation/reduction potential), total volatile solids, sediment grain size and metals at the "0 m station" (immediately adjacent to the net pen array). In addition, free sulphide and redox are monitored at two 30 m compliance stations.[2]

[2] Note that all monitoring stations are located along the principle tidal axis.

Figure 1: Overhead Schematic of a "Typical" layout of fish farm sampling transects over soft ocean bottom sites



After reviewing the historic monitoring data generated at 0 m and 30 m stations, the ministry intends to maintain requirements for the 0 m station with the same suite of parameters (as part of the harmonization process with DFO) – with two exceptions: 1) the required suite of metals to be analyzed will be expanded from only copper and zinc, to a full metal scan; and 2) sediment grain size will not be analyzed. This will produce much more useful data. For example, recent scientific literature points to the utility of elements such as lithium as tracers for determining the extent and shape of a copper and/or zinc farmed induced enrichment zone.

The ministry's review supported continued use of the 30 m stations for compliance purposes but noted a lack of secondary parameters to support the free sulphide compliance parameter. The ministry is recommending that the same suite of parameters sampled at the 0 m stations also be sampled at the 30 m stations with the addition of sediment grain size.

The ministry is intending to continue the prestocking standard of 1 300 uM free sulphide for the 30 m compliance stations. If this concentration is not met during peak biomass sampling, the proposed regulation will require fallowing until the standard is met.

C. *Review of sulphide standards and triggers in relation to ecological threshold approach*

Scientific studies have shown that sediments associated with up to 6 000 uM free sulphide can contain (environmentally) beneficial polychaete complexes. Polychaetes assist in the remediation of organic waste through digestion and bioturbation.

The ministry proposes reducing the peak production regulatory standard at the 30 m compliance stations from the present 6 000 uM to 4 500 uM. This standard would ensure the presence of beneficial polychaete complexes – with the potential of increasing the remediation rate and recovery of the farm site (reducing the period required for fallowing).

D. *Sampling protocols for large net pen arrays oriented perpendicular to major current flows*

Since the regulation was promulgated in September 2002 farm production has increased significantly, along with a corresponding increase in the size of the net pen array at a number of farms. For these farms, the ministry believes that more than one sampling transect is needed to better understand the magnitude of potential farm impacts.

The ministry is intending to amend sampling requirements in the regulation to require at least two additional sampling transects for fish farms where net pen arrays exceed 200 m in length. These transects would be required to be located along the two dominant current directions, with the specific location of additional transects and sampling stations established through modeling or other assessment methods. This change will enable monitoring that reflects the extent of the fish farm's footprint, and will harmonize with the DFO mandate to protect fisheries resources (including nearshore habitat).

4.5 Updating Schedules A and B of the regulation and Protocols for Marine Environmental Monitoring

Schedules A and B of the regulation describe the required monitoring parameters to be sampled when generating both baseline and operational data. They also describe where (spatially) the data is to be generated and how it must be reported. The ministry intends to update these schedules – based on the proposed changes to the regulation outlined in this document.

The Protocols for Marine Environmental Monitoring are a guidance document supporting the regulation. They contain detailed instructions on how to generate and analyze physical, chemical and biological data. They will be updated on a more frequent basis (than regulatory schedules) to reflect new technologies and methods in marine environmental monitoring.

4.6 Effective regulation that ensures environmental protection while allowing industry increased production efficiency

A survey of fish farm industry representatives was conducted under direction of the technical committee to identify scenarios where flexibility in the regulation may be appropriate. The survey identified several aspects of the regulation that could be amended to allow industry more flexibility in producing fish, while ensuring the protection of the environment. These aspects are discussed in the following subsections (A-C).

A. Use of transfer/harvest pens

Transfer/harvest pens are used to move fish within and between farms, allowing management flexibility and enabling the temporary holding of fish. However, they can also be used to hold fish at a site on a "semi-permanent" basis – outside of the registered tenure area and/or contributing to increased waste production.

The ministry intends to amend the regulation to clarify the definition of, and standards applied to, transfer/harvest pens. For the purposes of this regulation the proposed definition will be "pens in which fish are fed that are used for the temporary handling, holding and movement of fish and are in use for a maximum 90 day period at a specific location."

The proposed amendment to the regulation would also require that transfer pens be located so that access to appropriate 0 m and 30 m sampling stations within 30 days of peak biomass be assured by the farm operator. Use of transfer/harvesting pens beyond 90 days could trigger a requirement for an amendment to the fish farm registration (under the regulation) to acknowledge the structures as "permanent" – with all incumbent requirements, as well as additional sampling to ensure regulatory standards are met at the 30 m compliance stations.

B. Restocking of an alternate net pen array

Under the existing regulation, alternate net pen arrays within a registered fish farm may be restocked if "edge of tenure" sampling stations are in compliance with regulatory restocking standards. The existing regulation also allows stocking of a new net pen array if the new array does not overlap with the original one (even if the original is not meeting the regulatory standards at the 30m sampling stations). The regulation does not authorize the operation of multiple net pen arrays concurrently on a given tenure.

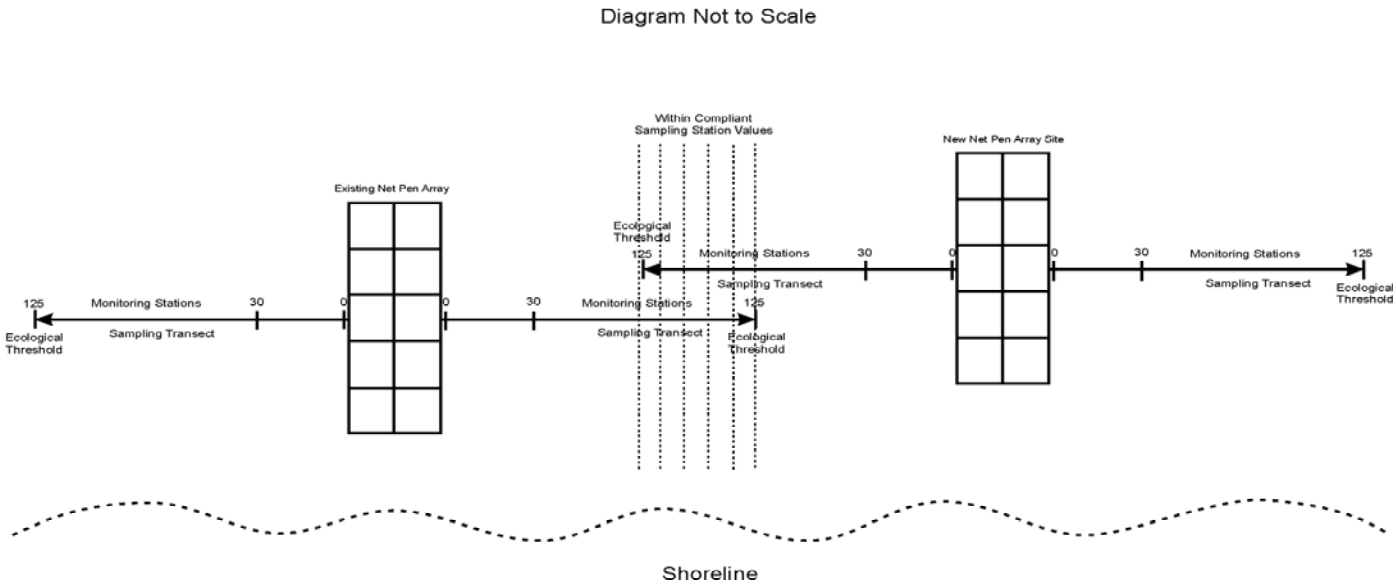
As discussed in section 4.4, the ministry intends to replace requirements for "edge of tenure" monitoring in the existing regulation with "ecological threshold" regulatory standards. This will result in changes in operational practices, as well as the regulation of tenures with alternate net pen array options.

The ministry intends to maintain the requirement that only one active net pen array operate on tenure at any one time. If the ecological threshold sampling station (at 125 m) of a new net pen array location overlaps with any non-compliant sampling station associated with the previously active net pen array (30 m or 125 m), the fish farm operator would not be able to restock the new site until both the (previously) non-compliant station, and the ecological threshold station associated with the (new) alternate location, meet environmental standards set out in the regulation.

If the non-compliant station from the previously active net pen array is not in the overlap zone with the "ecological threshold" station, and all compliance sampling stations associated with the new cage location comply with the prestocking standard, the new net pen array could be restocked. The previously active cage location would be fallowed and undergo remediation (see figure 2 next page).

This proposal incorporates an ecosystem-based approach that maintains environmental protection standards while allowing for a degree of flexibility in farm siting. Monitoring and observance of consistent standards for ecological threshold monitoring in overlap areas will be required. Alternative sites within the tenure may be utilized – where ecological threshold monitoring standards have not been exceeded.

Figure 2: Overhead Schematic of Restocking an Alternate Net Pen Array



C. Requirements for routine peak biomass monitoring

The existing regulation requires compliance monitoring prior to restocking – regardless of site production and compliance history. Some facilities consistently maintain compliance with the regulation through multiple grow-out cycles (as evidenced through ministry compliance data and reviews).

The ministry proposes amending the regulation to waive the peak biomass monitoring requirement for **one** grow-out cycle of fish (or **two** "smolt" cycles – with a cumulative time of no greater than two years) if compliance with requirements of the regulation has been established for at least **two** production cycles of fish (or smolts for smolt sites) and there are no: a) increases in production; or b) changes in net pen array (e.g., relocation, reorientation, changes in type or number). This monitoring cycle would continue until the operation of the fish farm changes significantly or non-compliance issues are found.

The proposed approach is in keeping with the ministry's intent to support good stewardship and to focus monitoring (compliance verification) and enforcement efforts on sites with higher environmental risk.

4.7 Harmonization of regulatory requirements with other applicable ministries and federal agencies

Ministry staff has worked with representatives of the Ministry of Agriculture and Lands and the Department of Fisheries and Oceans to reduce the administrative burden on the aquaculture industry. At the present time there is duplication in some of the monitoring programs. Many of the preceding proposals will result in increased harmonization by reducing duplications in sampling and monitoring programs. This will reduce monitoring costs for industry, the amount of data for regulatory agencies to analyze, and should lead to a data base more useful to all parties.

4.8 Certification provisions and policy for data providers

Generating scientific monitoring data in the marine environment can be difficult due to a number of factors including water depth, tidal currents, weather

and physical obstructions (such as anchor lines, net pens and variable substrate types). As well, measurement of chemical parameters such as total free sulphide, requires precise calibration and specific operational protocols. Without adequate training and experience, data submitted by a provider may not be acceptable to the ministry, resulting in delays and costs to both industry and the ministry.

It is the intent of the ministry to initiate a process of certifying all those who generate compliance data for submission to the ministry. This will include those who generate physical, chemical, biological and video data. It is proposed that only providers who take one or more appropriate courses, and have at least one year of field experience, will be certified. Certification may be administered by an independent organisation.

It is the intent of the ministry to have mandatory certification in place by mid 2009.

5. Best Management Practices

The regulation requires supporting Best Management Practices documents that provide information regarding how fish farm operators can meet ministry goals for protection of public health and the environment and manage harmful materials in a manner that is consistent with the *Environmental Management Act*, and associated relevant regulations and codes of practice. These practices and procedures could be based on existing Best Management Practices developed by the industry associations and/or developed jointly with government.

Section 8 of the regulation includes a requirement to develop a Best Management Practices Plan. This requirement will be reviewed with regard to content and terminology and may be amended to be consistent with other regulations under the *Environmental Management Act.*

6. Assuring Compliance

6.1 Compliance promotion

The ministry will develop a strategy for the promotion of voluntary compliance with the requirements of this regulation, in cooperation with industry associations and other interests. Compliance promotion may entail training for ministry staff, as well as information and education for those concerned with the operations and management of fish farms.

6.2 Compliance verification

The ministry's approach to assuring compliance with the Finfish Aquaculture Waste Control Regulation will include regular and random compliance reviews and inspections, as well as reviews and inspections in response to identified or potential issues or concerns regarding protection of the environment or public health and safety.

The ministry is committed to using compliance verification data to guide the ongoing management of fish farm waste control practices and to ensure that the goals for environmental protection are being met.

6.3 Enforcement

The ministry response to non-compliance will entail written advisories, warnings, directives, tickets and prosecutions. The choice of response will be based on ministry-wide policy, the compliance history for the fish farm operator and the significance of the impact from the non-compliance occurrence.

7. Providing Comment on Proposed Intentions for the Regulation

The ministry is intending to finalize the Finfish Aquaculture Waste Control Regulation amendments in 2009. Comments regarding the proposed intentions of the ministry are being solicited and will be carefully considered in the review and development process. The ministry welcomes all suggestions with respect to any aspect of the regulation.

Submissions will be compiled and summarized, without specific attribution, by an independent contractor and the summary posted on the ministry website. Following review of comments and submissions, the ministry will complete legal drafting of the regulation for legislative review and implementation.

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This intentions paper and a response form with questions based on proposed intentions for the regulation have been posted on the ministry's web site: www.env.gov.bc.ca/epd/codes.

Those interested are invited to submit comments using the instructions and questions provided on the response form. Individuals or organizations may also make written submissions to the ministry without following the format set out in the response form – as desired.

Comments to the ministry should be made on or before November 21, 2008.

All submissions will be reviewed for inclusion in a consultation summary report. Comments received will be treated with confidentiality by ministry staff and contractors when preparing consultation reports. Please note that comments you provide and information that identifies you as the source of those comments may be publicly available if a Freedom of Information (FOI) request is made under the *Freedom of Information and Protection of Privacy Act*.

If you have any questions or comments regarding the consultation process, review the information posted on the ministry website, or contact Cindy Bertram of C. Rankin & Associates, who has been contracted to manage consultation comments, at:

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Thank you for your time and comments!