Measurement Assurance and Certification Scotland

INTERIM PERFORMANCE STANDARD MACS-FFA-01

Finfish Aquaculture Sector

Baseline survey & seabed and water quality monitoring plan design

Version 0.1
June 2019

The following interim MACS performance standard has been produced in order to support the implementation of our updated and strengthened regulatory framework for the Finfish Aquaculture sector.

Its content will evolve over the course of the phased transition period and beyond; as we continue to work closely with operators, partner organisations and other interested stakeholders to further develop and refine aspects of the new framework.

For the latest versions of all MACS documentation applicable to activities in this sector, please refer to the **SEPA website**.

UPDATE: April 2020

In response to feedback received from the sector, the content of this interim MACS performance standard is currently under internal review.

Some requirements specified by this version may no longer be applicable, and will be superseded upon publication of a revised document. Although this version remains available on the SEPA website, it should now be considered for reference purposes only.

Should you have any questions, or require any advice in relation to the content of this document, please contact us by emailing **aquaculture.monitoring@sepa.org.uk**.

Contents

1 Introduction

Every day SEPA works to protect and enhance Scotland's environment, helping communities and businesses thrive within the resources of our planet. We call this One Planet Prosperity - if everyone in the world lived as we do in Scotland we would need three planets. There is only one.

We're creating a world-class, 21st Century EPA by grounding our regulatory activity across whole sectors, and moving away from a site by site approach.

A fundamental principle of our sector approach is that environmental compliance is non-negotiable. In every sector, we will ensure that all regulated businesses fully meet their compliance obligations.

In certain sectors, this means that operators performing authorised activities have an obligation to monitor and report back to us in support of the regulation of those activities. We will determine compliance from the data and evidence submitted to us.

In order to maintain confidence in our regulatory decision making, all operator monitoring data must meet our minimum quality requirements. To help operators meet those requirements, we have established Measurement Assurance and Certification Scotland (MACS) - our quality assurance certification scheme.

MACS comprises a range of performance standards and technical guidance documents, each designed to ensure that operator monitoring data is fit for regulatory assessment. Its remit extends across the entire monitoring process; from planning and scheduling of monitoring activity to sampling, analysis and data reporting.

Where an organisation complies with the requirements of MACS, they will be considered competent to supply operator monitoring data to us. To ensure they remain compliant, certified organisations will be routinely audited - either by SEPA or an appropriate external accrediting body.

Further information on MACS, operator monitoring and our sector approach may be found via the SEPA website:

www.sepa.org.uk

2 Scope

2.1 This interim MACS performance standard is applicable to organisations undertaking baseline surveys or designing a seabed and water quality monitoring plan (SWMP) for marine pen fish farms.

2.2 Sections 5 and 6 lay out the detailed requirements that those organisations must adhere to when producing information intended for submission to SEPA in relation to those activities.

2.3 Additional guidance, which may be applied by an organisation in order to meet certain specific requirements, is presented in Annexes A to C.

3 References

a. BS EN ISO 5667-19:2004 - Water quality - Sampling. Part 19: Guidance on sampling in marine sediments, ISBN 0 580 43945 3.

b. BS EN ISO 19493:2007 - Water quality. Guidance on marine biological surveys of hard-substrate communities, ISBN 978 0 580 54108 7.

c. Common Implementation Strategy for the Water Framework Directive (2000/60/EC), Guidance Document No: 25 - Guidance on chemical monitoring of sediment and biota under the Water Framework Directive.

4 Terms and definitions

For the purpose of this interim MACS performance standard, and unless the context requires otherwise, the following definitions shall apply:

allowable mixing zone – the maximum allowable area of impact from a fish farm, calculated by applying a 100 metre radius around each pen. Its shape will be based upon the farm's modelled impact area.

baseline survey – a survey with emphasis on characterisation and description of conditions in the survey area, which forms the basis for future monitoring and/or follow-up surveys.

biotope – a habitat and its characteristic assemblage of plant and/or animal species.

epifauna – animals living on the surface of the seabed, or attached to submerged objects, aquatic animals or plants.

habitat – an area of uniform environmental conditions.

hard substrate – substrate consisting of bedrock, larger rocks/stones or fixed marine constructions such as wharfs, quays and pipelines.

marine pen fish farm (MPFF) – a fish farm based upon a system of pens, constructed as floating collars with net bags suspended in the water column beneath. Farmed fish are held in the net bags, and waste and effluent flow from the pen(s) into the water environment under the influence of local currents.

operator – an individual or company responsible for the operation of an existing or proposed marine pen fish farm that will be subject to operator monitoring activities.

NOTE: With respect to the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR), the operator is the 'Authorised Person' defined and identified as such in the CAR authorisation.

organisation – an entity performing an activity or activities required under operator monitoring. In the context of this performance standard, this term encompasses an operator, or a body appointed by that operator to undertake operator monitoring activity on their behalf.

priority marine features (PMFs) – habitats and species that are considered marine nature conservation priorities in Scottish waters. A list may be obtained from Scottish Natural Heritage.

production cycle – a period of time at a site beginning when fish are introduced, and ending once all fish have been removed (either through slaughtering operations or by being relocated).

reference station – one or more sampling stations chosen to represent environmental conditions in a given area, i.e. free from direct anthropogenic influences.

remotely operated underwater vehicle (ROV) – remote-controlled underwater vehicle with video camera and often the possibility for mounting additional equipment (e.g. sonar, manipulator arm, etc.).

replicate samples – a series of samples collected in the same time frame, at the same sampling station and in the same manner for statistical validity and comparison.

sample – a volume of water or sediment collected from a sampling station and identified for the assessment or measurement of specific determinand(s).

sampling station – a precise location within the water environment from which a sample is collected. It may be discrete or form part of a transect.

seabed and water quality monitoring plan (SWMP) – a plan detailing how an operator intends to survey and monitor various components of the water environment to show the degree of impact of a marine pen fish farm and demonstrate its compliance with relevant environmental quality standards.

site – the location of an existing marine pen fish farm, or the proposed potential location of a new marine pen fish farm.

transect – a line across the water environment along which multiple observations are made or multiple samples are collected.

5 Process requirements for baseline survey

As part of the pre-application process, the operator must submit a baseline survey plan to SEPA. Baseline surveys must:

- characterise the seabed in and around a farm's predicted area of impact;
- identify any protected habitats or species within that area;
- provide an assessment of the existing environmental status of the seabed, including existing impacts;
- address any potential risks identified in the wider area.

5.1 Identification of survey area

5.1.1 The minimum baseline survey area required must be identified by extending the allowable mixing zone along its major and minor axes by 50 metres in all directions, or to a distance of 150 metres from the pen edge - whichever is the greater; and enclosing this extended area. An example is given in Figure 1 below:

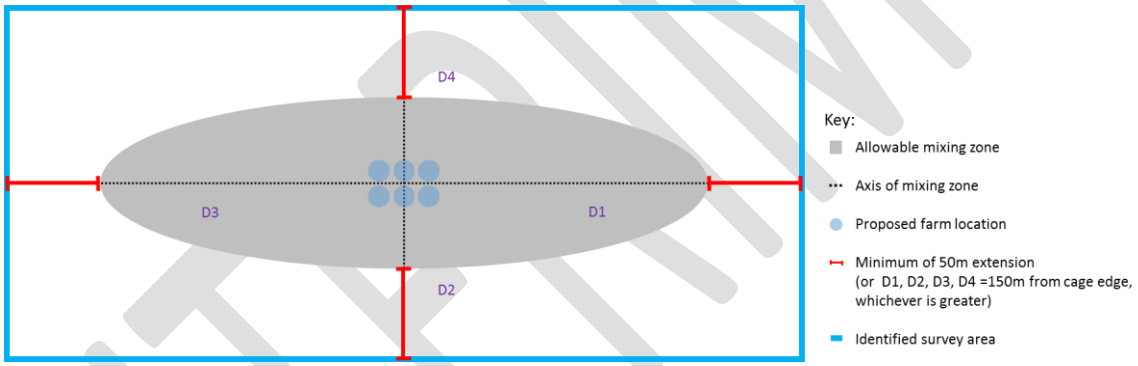


Figure 1. Survey area identification.

5.2 Seabed assessment

5.2.1 Within the identified survey area, an initial visual assessment of the seabed must be performed prior to any detailed baseline survey design taking place.

5.2.2 The extent of this assessment must be sufficient to identify the broad habitat types found within the survey area, and the boundaries between those habitats.

5.2.3 All video footage collected must:

- be in colour and on USB memory stick;
- be at an appropriate height above the seabed such that features, including epifauna and biotope type, are in focus;
- be correctly illuminated such that features on the seabed can be clearly discerned;
- ideally be taken at a frame rate of at least 60 frames per second.

5.2.4 In addition, all drop down video footage must be geo-referenced; whilst all continuous footage requires the positional information of the camera or boat to be recorded at all times.

5.2.5 Video footage submitted to SEPA must be provided along with the following metadata:

- Camera make and model.
- Resolution and frame rate of the recording (e.g. 4K60, 1080p @ 60fps, etc.).
- Details of lighting used.

5.2.6 All data collected during seabed assessment must be submitted to SEPA along with the baseline survey report.

> For further guidance on how to perform baseline survey seabed assessment, refer to **Annex A**

5.3 Survey design

5.3.1 Sampling effort must be sufficient to provide an assessment of the status of each habitat type. By using a targeted approach, required sampling effort will be less where the seabed is homogenous than in a heterogeneous environment.

5.3.2 Within each soft sediment habitat identified during seabed assessment, a sufficient number of sampling stations must be randomly distributed within that area.

In order to allow for reasonable characterisation, a minimum of five sampling stations must be located within each habitat.

NOTE 1: Under certain circumstances (e.g. conditions of greater variability) SEPA reserves the right to require a greater minimum number of sampling stations.

NOTE 2: Where PMFs have been identified during seabed assessment further consultation with SEPA will be required in order to determine an appropriate monitoring approach.

5.3.3 To determine the location of sampling stations within a habitat, a semi-probabilistic sampling approach must be applied:

- Sampling grids will be placed over each individual habitat.
- Grid spacing for a habitat will be proportional to that habitat's size.
- Sampling stations for each habitat must be randomly distributed within each grid.

An example is given in Figure 2 below:

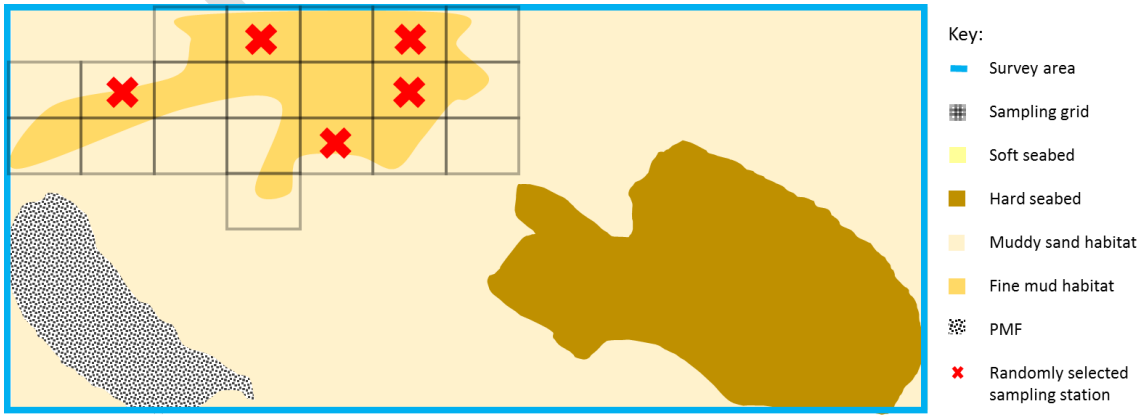


Figure 2. Semi-probabilistic sampling approach with randomised sampling stations.

5.4 Sampling requirements

5.4.1 At each soft sediment sampling station, grab samples must be collected for the following parameters:

- Benthic Invertebrates
- Particle Size Analysis (PSA)
- Total Organic Carbon (TOC)

NOTE: It is imperative that areas where PMFs have been found are not subject to invasive sampling techniques.

5.4.2 Where there is previous use of in-feed medicine within the waterbody or wider area within which the proposed farm is to be sited, then chemical residue samples must also be collected and analysed.

5.4.3 SEPA reserves the right to require that samples are collected for additional analyses depending on the risks identified during the pre-application process.

5.4.4 Where seabed assessment has identified areas that cannot be grab sampled (i.e. hard substrate habitats and/or some types of PMF) then these areas must be subject to a more detailed visual survey.

5.5 Wider area risk assessment

5.5.1 Where local bathymetry and/or model outputs identify potential sinks or hotspots of deposition then additional sampling may be required outside of the identified survey area.

If so, this requirement will be identified during the pre-application process. This is also the case for any other risks identified, for instance:

- Nearby protected features that lie out with the identified survey area.
- Elevated nutrient levels.

5.6 Modifications to existing sites

5.6.1 In order for SEPA to assess whether environmental capacity exists to accommodate a proposed expansion or modification to a MPFF, operators must carry out a baseline survey - the design of which will be determined by existing habitat data for the new allowable mixing zone.

5.6.2 At least one environmental monitoring survey must have been carried out prior to applying for any type of modification to an existing site.

5.6.3 **Identification of survey area**
See section 5.1 above.

5.6.4 **Seabed assessment**
See section 5.2 above.

5.6.5 **Survey design**

5.6.5.1 Where seabed assessment identifies that the broad habitat(s) within the new baseline survey area are different to those from within the farm's existing area of impact, then a sampling grid must be applied as per section 5.3 above.

5.6.5.2 Where seabed assessment identifies that the new baseline survey area is comprised of the same broad habitat(s) as within the farm's existing area of impact, then survey design must follow the multiple transect approach as per section 6.2.1 below.

5.6.6 **Sampling requirements**
See section 5.4 above.

6 Process requirements for environmental monitoring

6.1 Seabed and water quality monitoring plan (SWMP)

6.1.1 It is a condition of each permit for a marine pen fish farm issued under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) that a seabed and water quality monitoring plan (SWMP) be prepared by the operator and submitted to SEPA for agreement.

The SWMP shall detail all aspects of an operator's environmental monitoring strategy for an individual site. It must:

- provide sufficient data to demonstrate compliance with relevant environmental quality standards;
- allow SEPA to assess the spatial extent of the impacts from the farm;
- allow SEPA to assess the cumulative effects of the farm in concert with other farms in the same waterbody, and neighbouring waterbodies (where relevant);
- provide assurance that the status of the overall water body is maintained;
- demonstrate that no natural heritage protected features have been impacted beyond their tolerance.

6.1.2 As a minimum, the SWMP must include the following information:

- Site name, operator name, permit number.
- Species of fish, permitted biomass, permitted medicines/chemicals.
- Diagram showing pen configuration and locations, modelled impact area, allowable mixing zone, transects and sampling stations.
- Rationale behind selection of transects and sampling stations.
- Parameters sampled at each station and collection method(s) to be used.
- Detail of sample handling and preservation techniques.
- Equipment to be used for the sampling and storage of samples.
- Details of organisation(s) performing sampling and analysis activities.
- Any other relevant information that SEPA may reasonably require.

6.1.3 SWMPs must be reviewed by the operator prior to the commencement of each new production cycle at a farm.

For further guidance on creation of seabed and water quality monitoring plans, refer to **Annex B**

6.2 Environmental monitoring survey

The aim of an environmental monitoring survey is to measure the impacts from a MPFF in order to assess compliance with relevant environmental quality standards.

6.2.1 Survey design

6.2.1.1 Environmental monitoring survey design must be based upon multiple transects with multiple sampling stations located on each transect.

6.2.1.2 A minimum of four transects originating at the pen edges are required, with two oriented along the major axis of the allowable mixing zone and two along the minor axis.

6.2.1.3 In any given direction, the minimum transect length must equal the greater value of either:

- the extent of the allowable mixing zone plus 50 metres;

  or

- 150 metres from the pen edge.

6.2.1.4 A minimum of seven sampling stations must be located along each transect. Of these:

- one sampling station must be located at the pen edge;
- one must be located at the edge of the allowable mixing zone;
- at least two must be located beyond the edge of the allowable mixing zone.

6.2.1.5 Sampling stations must be sufficiently spaced to allow a gradient or trend of impact to be determined along a transect. Consecutive sampling stations must be a minimum of 10 metres apart.

For further guidance on how to design environmental monitoring surveys, refer to **Annex C**

6.2.2 Sampling requirements

6.2.2.1 At each soft sediment sampling station/reference station, grab samples must be collected for the following parameters:

- Benthic Invertebrates
- Chemical residues (where licenced for use)
- Particle Size Analysis (PSA)
- Total Organic Carbon (TOC)

NOTE: Where residue sampling is required, three replicate samples must be collected from each sampling station for that purpose.

6.2.2.2 SEPA reserves the right to require that samples are collected for additional analyses depending on the risks identified during the pre-application process.

6.2.2.3 Where a sampling station is located over an area that cannot be grab sampled (i.e. hard substrate habitats and/or some types of PMF) then further detailed visual survey footage must be collected.

6.2.3 Survey timing

6.2.3.1 All surveys must take place when it is probable that the greatest impact will be observed from the site. For each production cycle, an estimation of this time must be identified by the operator and detailed in the SWMP.

6.2.3.2 For a typical production cycle, sampling for all required parameters must be undertaken within the 30 day period either side of the date that fish biomass on the

site has reduced to 75% of the peak biomass for the last time during that cycle; but must not take place within 14 days of peak biomass (see Figure 3).

NOTE: Where non-typical stocking strategies are used at a site, alternative proposals for survey timing can be developed by the operator as part of their SWMP.

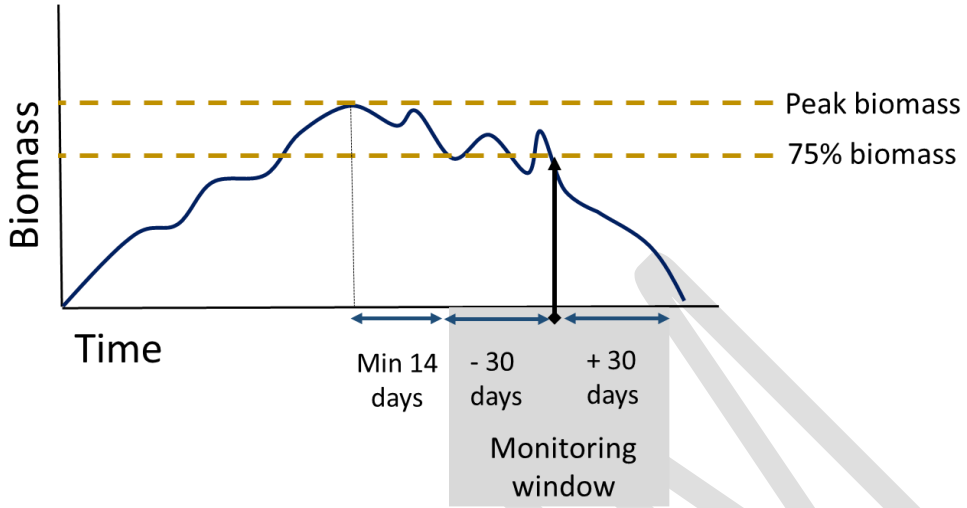


Figure 3. Survey timing window.

6.2.3.3 If the period when the highest predicted concentration of Emamectin benzoate does not correspond to the timing of the soft sediment survey detailed above, then an additional survey for medicine residues must also be carried out.

6.2.3.4 The additional survey must take place between 80 and 169 days after the cessation of the last Emamectin benzoate treatment in the production cycle; and requires samples to be collected at specific sampling stations, as identified in Figure 4 below.

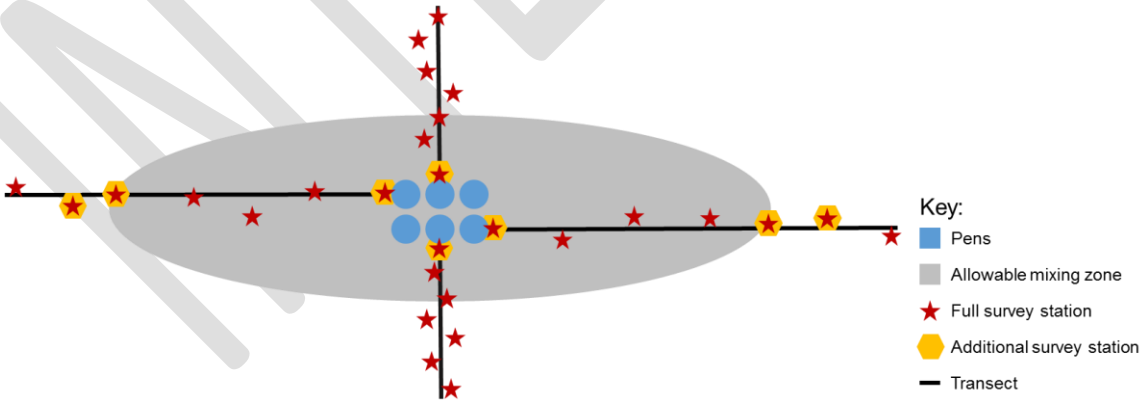


Figure 4. Additional survey sampling station locations.

6.2.3.5 Where the results of additional survey work indicate that a relevant environmental quality standard has been exceeded, then a full transect survey must be carried out.

7 MACS document review and control

7.1 All MACS documentation will be subject to review and amendment. For the latest versions of all MACS performance standards, please refer to the SEPA website:

www.sepa.org.uk

Annex A

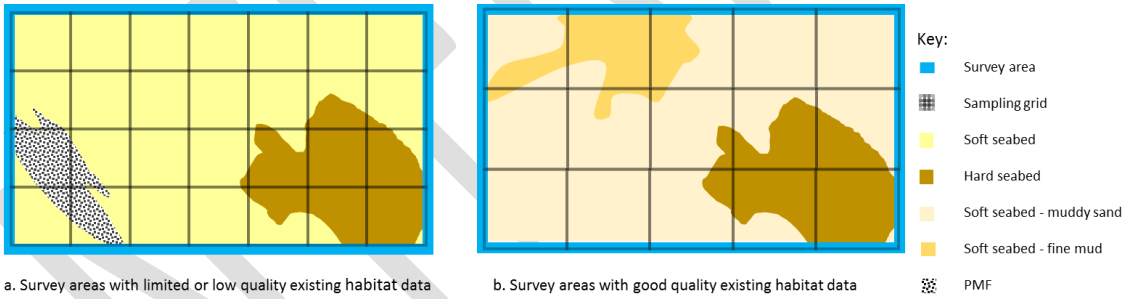
Additional guidance - Baseline survey seabed assessment

The following guidance may be applied to aid the planning and performing of seabed assessments for baseline survey. It should be read in conjunction with the contents of section 5.2 above.

A.1 A sampling grid should be applied across the survey area to allow the extent of the required assessment to be determined appropriately.

A.2 Existing habitat data, where available, may be used to help determine the spacing of the grid applied:

- Where existing habitat data is lacking, or it indicates the presence of PMFs within the survey area, then footage will be required in order to produce a detailed map of the survey area. Specific sections within the survey area may need to be surveyed in more detail (see Figure A1a).
- Where sufficient existing habitat data is already available in order to produce a map of the survey area, the amount of footage required from the visual survey may be reduced proportionally - providing that the survey confirms that any existing data is correct and also covers enough ground to pick up the presence of any previously unidentified PMFs (see Figure A1b).



Figures A1a and A1b. Examples of seabed assessment approaches.

A.3 Collection of visual survey data may be achieved using one of the following approaches:

- Drop down video at gridline intersections (see Figure A2).
- Continuous footage collected along lengthwise gridlines e.g. by towed camera or remotely operated underwater vehicle (ROV) (see Figure A2).

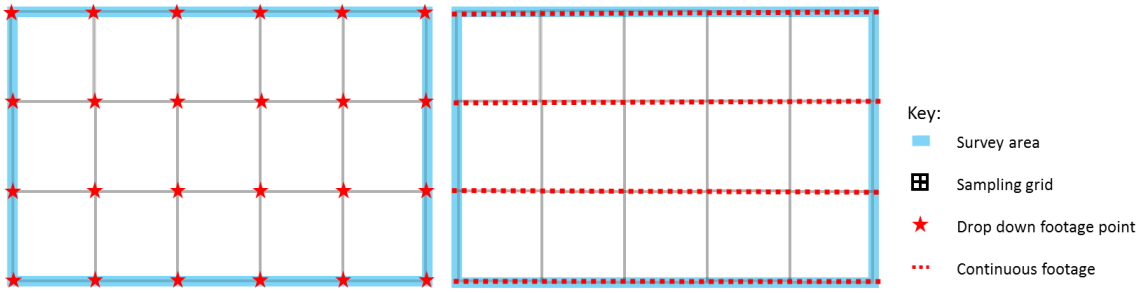


Figure A2. Drop down (left) and continuous (right) video approaches.

Annex B

Additional guidance - Seabed and water quality monitoring plans

The following guidance may be applied to aid the creation of a seabed and water quality monitoring plan for submission to SEPA. It should be read in conjunction with the contents of section 6.1 above.

Once agreed by SEPA, finalised SWMPs will be maintained as part of an operator's CAR permit.

B.1 Where review of an SWMP identifies that changes are required, they must be agreed by SEPA before being implemented by the operator. The revised SWMP will require a variation to the site permit which should be applied for by the operator within three months of the start of the new production cycle.

B.2 Where review of an SWMP identifies that no changes are required, the existing SWMP will continue to define the monitoring requirements for the site to which it applies

B.3 Where environmental monitoring carried out by an operator demonstrates that relevant environmental quality standards have been met for two or more consecutive production cycles, and provided that there are to be no changes to any other conditions within the site permit, the scale of monitoring in the SWMP may be reduced.

The operator should develop such reductions in consultation with SEPA, and submit a revised SWMP to SEPA for agreement. The revised SWMP will require a variation to the site permit which should be applied for by the operator within three months of the start of the new production cycle.

B.4 Where environmental monitoring carried out by an operator demonstrates that relevant environmental quality standards have not been met, SEPA may require that the scale of monitoring in the SWMP is increased.

SEPA will develop such increases in consultation with the operator. The revised SWMP will require a SEPA-initiated variation to the site permit which will be put in place within three months of the start of the new production cycle.

Annex C

Additional guidance - Environmental monitoring survey design

The following additional guidance may be applied to aid the design of an environmental monitoring survey. It should be read in conjunction with the contents of section 6.2.1 above.

C.1 Ideally, transects will be arranged orthogonally. Some examples of possible transect orientations are given in Figure C1 below:

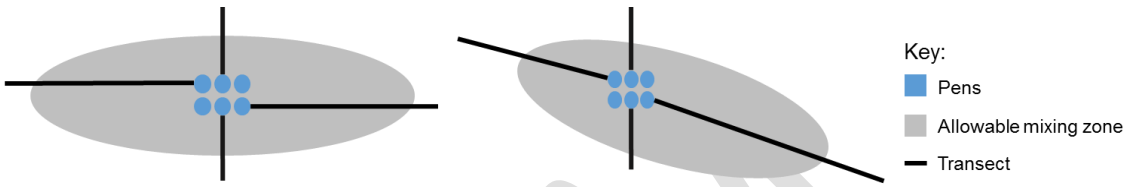


Figure C1. Examples of ideal transect orientation.

C.2 Modified transect arrangements may be required in certain circumstances (e.g. due to areas of hard substrate), and additional transects may be required where the allowable mixing zone is not generally ellipsoidal in shape. Such arrangements will be agreed in consultation with SEPA.

NOTE: Where a transect falls mostly over hard substrate, and cannot be accommodated through altering its orientation, a visual survey will be required along said transect.

C.3 Where a farm is arranged in two pen groups, transects should be arranged so that there is coverage in each outward direction. An example is given in Figure C2 below:

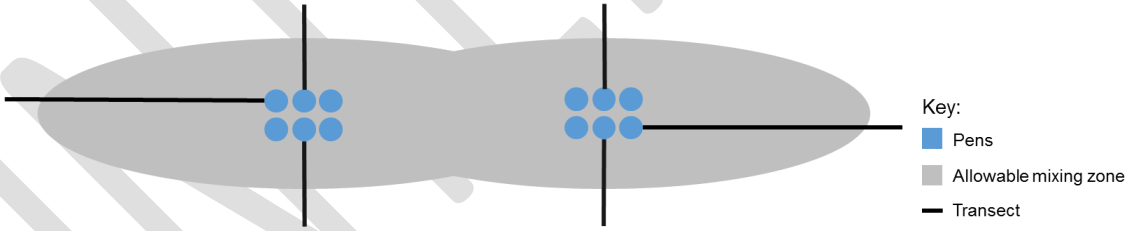


Figure C2. Example of two pen group transect orientation.

C.4 In the absence of any existing survey data, optimal survey design will place sampling stations at 25 metre intervals. An example is given in Figure C3 below:

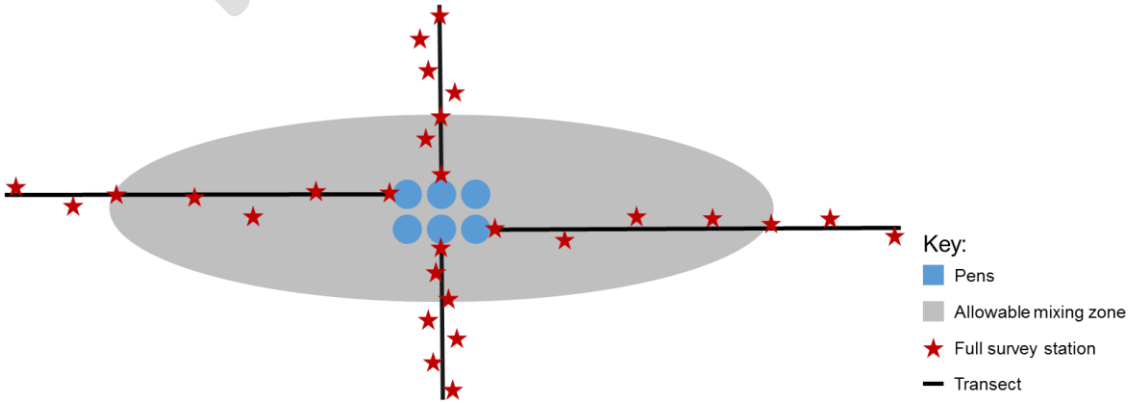


Figure C3. Sampling station positioning.

C.5 Reference stations may be included in an operator's environmental monitoring survey.

Where included, it is recommended that they be positioned at least 500 metres from the operator's farm, any other marine pen fish farm or other outfall/output into the water body.