

## ENVIRONMENTAL SURVEYS FOR THE AQUACULTURE INDUSTRY

### Environmental assessment of bottom fauna

#### Legislation

According to the Aquaculture Act (2005) all fish farmers have a duty to conduct the necessary environmental surveys and document the environmental impact from the facility on the surrounding environment. This monitoring shall fulfil the requirements in Norwegian Standard NS9410:2016. This standard covers pre-surveys, trend monitoring both in the facility zone (B-survey) and in the transition zone (C-survey).

#### Who we are

Our Environmental Unit is one of the leading suppliers of marine monitoring surveys in Norway. We are located in Høvik, Stavanger and Harstad. We are 30 highly qualified employees, with 15 qualified to be included in Environmental surveys for the Aquaculture industry. DNV GL has a bio-laboratory accredited after NS 9410:2016.

#### Our services

##### Pre-survey

The pre-survey is done prior to establishing of the aquaculture facility. It is also done in case of major expansion of the facility. The survey is done at the seabed where the facility will be placed in the facility zone and in the transition zone. The results give a base for best environmental placement of the facility as well as a baseline for future monitoring surveys. The survey includes current measurements; measuring of temperature, salinity and oxygen in the water column. In addition, sediment samples are taken for analysis on benthos, grain and chemical indicators.

DNV GL is accredited according to NS 9410:2016 and deliver the environmental survey report within three months after the field survey.

##### B-survey

The B-survey monitors the sediments in the facility zone. In this survey sediment samples are gathered close to the net cage. The sediment samples are examined on site for sensory parameters (odor, color, etc.), fauna, pH and redox potential. DNV GL delivers the report one week after the field survey.

##### C-survey

The C-survey monitors the sediments both in the facility and the transition zone. The survey is executed to assess the degree of impact to the surrounding environment. The survey includes current measurements; measuring of temperature, salinity and oxygen in the water column. In addition, sediment samples are taken for analysis on benthos, grain and chemical indicators.

DNV GL is accredited according to NS 9410:2016 and delivers the environmental survey report within three months after the field survey.

##### ASC survey

DNV GL's Environmental unit executes ASC surveys as a part of the certification by the Aquaculture Stewardship Council (ASC). The ASC survey consists of benthos analysis, measurement of redox potential, as well as copper analyzes within and outside the Allowable Zone of Effect (AZE).


DNV GL delivers the report three months after the field survey.

##### Environmental impact assessment

Prior to establishing of the aquaculture facility or in case of major expansion of the facility, the County Administration (Fylkeskommunen) evaluates if the facility will have substantial impacts on environment and/or society. Such impacts must be emphasized in the application and is done through an environmental impact assessment. Such an assessment describes biological diversity, natural resources, area use and possible conflicts to other interests in the area.

##### Litoral zone

Our Environmental Unit is accredited according to NS\_EN 19493:2007 and can execute different littoral zone surveys close to facilities:



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- Semi-quantitative survey: flora and fauna in the littoral zone is registered after a defined scale. The survey is used to monitor changes over time.
- Grid sampling: flora and fauna, or coverage, is registered in a smaller area in the littoral zone. The area is marked in order to monitor the exact same area over time.
- Survey in the littoral zone: a coarse registration of dominating algae groups and fauna over a larger area is registered.

DNV GL delivers the report one month after the field survey.

### Development of sustainable services for the aquaculture industry

Sustainability is central in DNVGL's vision. That implies that DNV GL has high focus on development of existing tools, methods and competence.

Examples:

- Dispersion model – DNV GL works to further develop our dispersion model for particles used for the offshore industry. The objective is to use the model in the aquaculture industry. The model aims to show dispersion of feed and faeces to the surrounding area. The goal is to map the production capacity and to establish a sustainability goal for each facility.
- Digital services – We work to develop digital tools to enable the fish farmers to gather all information on their facilities. This should be a real-time system to visualize and communicate information, both as an internal and an external tool.
- DNA analysis of sediment samples – There are several ongoing initiatives to use DNA sequencing as a method for environmental surveys in the aquaculture industry.

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