KENNEBEC RIVER BIOSCIENCES

Nordic Aquafarms Fish Health Assessments

Summary:

The health status of Atlantic salmon raised at Nordic Aquafarm's Belfast ME facility ('NAF') will be continuously monitored during all production stages for pathogens of concern to Maine Department of Marine Resources ('DMR'). Pathogen detections, disease diagnoses, and preventive (e.g. vaccination) or therapeutic options will be coordinated with NAF fish health personnel through Kennebec River Biosciences, Inc. of Richmond ME ('KRB').

Egg importations/Quarantine:

1. Eggs will be imported approximately every two months only from suppliers who meet the requirements of any required federal and state permits/approvals. The criteria for these permits/approvals include ongoing testing of the source stocks to ensure compliance with applicable United States Fish & Wildlife Service (USFWS) under Title 50 of the US. Code of Federal Regulations and/or Maine DMR egg importation requirements under Chapter 24.21 of the DMR Regulations (13 188).

2. Imported eggs will be disinfected at the originating source facility with iodophor prior to shipment as required under USFWS Title 50 criteria, and will be surface-disinfected on arrival at NAF with an iodophor compound according to industry standard practice. This process includes first disinfecting the external surfaces of the received boxes of eggs.

3. The disinfected eggs will then be placed into the Quarantine area in the fresh water section of the hatchery.

4. During the quarantine period (at least 8 weeks) 175 hatched fry will be tested (2% assumed pathogen prevalence level) approximately 30 days prior to intended release for bacterial, viral and parasitic pathogens of concern to DMR under Chapter 24.21 (also see the Post-quarantine/Production testing section later in this document). If pathogens of regulatory concern are detected, a response plan will be initiated that could include additional and/or confirmatory testing, various treatments, a partial or complete shut-down of the quarantine facility, or destruction of affected stocks and disinfection.

5. After the quarantine period (assuming no pathogens of regulatory concern are detected) fish stocks will be transferred to other sections of the hatchery and/or the main facility, where testing will continue on a scheduled basis, and good fish health practices will help ensure continuation of a disease-free status.

These processes will ensure compliance with applicable Maine Department of Marine Resources Chapter 24 or related regulations.

Post-quarantine/Production: Testing that occurs after release from importation quarantine will occur through a combination of surveillance of apparently healthy fish, and diagnostic testing of

any unhealthy stocks. Sampling approaches will be statistically significant as well as risk-based in terms of exposure and infectious or transmissive potential.

Production testing will typically include (but is not limited to) the following fish pathogens

- Bacteria: *Aeromonas salmonicida, Yersinia ruckeri, Listonella anguillarum, Vibrio salmonicida, Renibacterium salmoninarum, Piscirickettsia salmonis, Flavobacteria spp. (e.g. F. psychrophilum, F. columnare*); and others (e.g. *Edwardsiella piscicida, o*ther Aeromonads, Pseudomonads, *Chryseobacterium* spp., *Weissella* spp., Mycobacteria, etc.) will be routinely monitored through surveillance and/or diagnostic testing. Appropriate culture media will be used. Bacterial species that are isolated will be identified to at least the species level and/or genotyped through molecular techniques.

- Viruses: Infectious pancreatic necrosis virus, salmonid alphavirus, infectious hematopoietic necrosis virus, viral hemorrhagic septicemia virus, infectious salmon anemia virus, Oncorhynchus masou virus, piscine reovirus, and a range of other filterable replicating agents will be routinely monitored through surveillance and/or diagnostic testing. At least two recommended cell lines will be utilized for viral culture. Non-culturabel agents will be assayed using molecular tests. All cytopathic-effect producing agents will be identified through appropriate techniques (serological, molecular, etc).

- Protozoan, metazoan, crustacean and other parasites (including but not limited to *Ceratonova [Ceratomyxa] shasta, Myxobolus cerebralis, Gyrodactylus spp.* and *Tetracapsuloides bryosalmonae*) pose little or no risk of transfer via eggs as they are not known to be vertically transferred. However, these and other parasitic agents like *Trichodina*, *Epistylis* etc. will be periodically screened by various visual, microscopic and/or histological assays after release of fry from quarantine.

Saprolegnia, *Aphanomyces* and other fungal agents will be monitored on an as needed basis.

Vaccination: A vaccination program will be implemented by NAF, using inactivated vaccines that will be developed and supplied by KRB under applicable guidelines. This approach will act as an additional measure against losses and/or pathogen amplification due to the inadvertent introduction of certain endemic pathogens in the source water (fresh and brackish). Known pathogens such as *Aeromonas salmonicida*, *Yersinia ruckeri* ,*Listonella anguillarum* and Vibrios (such as *V. salmonicida, V. ordalii*, etc.) are known to be present in contiguous watershed areas, and will be included within a vaccine program. Immersion and injectable formulations of vaccines may be utilized. Based on wild fish surveillance that may be undertaken in such watersheds, other agents may be added into the vaccination regime as deemed necessary by NAF fish health staff.

Testing Assays: Pathogen detection assays will be performed by qualified technicians at Kennebec River Biosciences in Richmond, ME. In-house assays at NAF will also be developed to provide preliminary preparation for samples. Detection assays used by KRB conform to

procedures listed in the current version of the World Organization for Animal Health (OIE) Manual of Diagnostic Tests for Aquatic Animals, or the current edition of the American Fisheries Society/Fish Health Section's *Suggested Procedures for the Detection and Identification of Certain Finfish and Shellfish Pathogens*. For pathogens or test methodologies not covered in these manuals the best available science will be utilized and includes assays developed by KRB.

Since 1996, KRB has provided comprehensive testing and health services in the United States and internationally to fish farms, businesses, government agencies, and scientific research institutions involved with aquatic species. KRB has expanded from its original salmonid-centered testing services to other aquatic species, new products and services, improved detection assays, and the establishment of a worldwide client base. Today, it is among the largest commercial labs of its kind in the Americas.

KRB is recognized by numerous international, national, regional, and state regulatory authorities. The lab performs both diagnostic and regulatory testing for virtually all finfish, shellfish, and crustacean species. Health solutions utilized by KRB's clients include surveillance and certification testing; autogenous vaccines; veterinary consultation; and contract research to solve aquatic animal health problems, or to add pre- or post-harvest value. KRB is approved by USDA APHIS Veterinary Services for export testing of 14 pathogens of aquatic animals. The CEO of the lab is also a US Fish & Wildlife Services Title 50 Inspector as well as a AFS-FHS Fish Health Inspector.

KRB will provide ongoing veterinarian services through its USDA-accredited and Maine licensed veterinarian (Cat. II) for NAF under a valid Veterinary-Client-Patient relationship, which includes setting up monitoring and testing programs. Any preventive or therapeutic treatments that may be necessary to ensure optimal fish health will be made under veterinary supervision and/or prescription (as applicable), and will conform to all applicable regulatory and documentation guidelines.

In addition, KRB will provide any necessary technical or other training requested for qualified fish health technicians at NAF who manage the monitoring and testing programs, as well as the fish health management program in general.

Website: www.kennebecbio.com

By: William R. Keleher
Signature

Print Name: William R. Keleher

Title: CEO/President

Date: 08-January-2020

By: _____
Signature

Print Name: Peter L. Merrill, DVM

Title: Staff Veterinarian

Date: 08-January-2020

Acknowledgement

An acknowledgement is a formal admission made in person before a proper official by someone who has executed an instrument. The signer must personally appear before the Notary Public, the signer must be positively identified by the Notary Public and the signer must acknowledge having willingly signed the document.

State of Maine - County of Sagadahoc

The Foregoing instrument was acknowledged before me this 08th day of January 2020, in Richmond, Maine, by: William R. Keleher and Peter L. and Merrill, DVM to be his/her free act and deed.

Rebecca J Boulanger

Signature of Notary Public

Name of Notary Public: Rebecca J Boulanger **SEAL**

Notary Public, State of Maine

My commission expires: 09/29/2020