



**PLACENTIA BAY ATLANTIC SALMON AQUACULTURE PROJECT
GRIEG NL NURSERIES LTD. AND GRIEG NL SEAFARMS LTD.**

List of Substances, Agents or Chemicals to be Used

Submitted to Health Canada

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Introduction and Background

Grieg NL Nurseries Ltd. and Grieg NL Seafarms Ltd. (Grieg) are planning to construct and operate a land-based Recirculation Aquaculture System (RAS) Hatchery for Atlantic Salmon in the Marystow Marine Industrial Park and 11 marine-based farms in Placentia Bay, NL. The land-based hatchery will produce up to seven million triploid smolt annually, which will be sold to salmonid aquaculture farms in the province and will be developed on approximately 10 hectares of serviced land. The 11 marine-based farms will be located in four Bay Management Areas: Rushoon, Merasheen, Red Island, and Long Harbour. Each marine-based farm will consist of multiple cages with cage collars at the surface and nets extending down to approximately 43 m. The Bay Management Areas will occupy 1,958 hectares of which 24 hectares will be occupied by the sea cages.

The Project was registered for Environmental Assessment (EA) review under the Newfoundland and Labrador *Environmental Protection Act* (NL EPA, Part 10) in February 2016. Following governmental and public review of the EA Registration, the Minister of Environment and Conservation announced on July 22, 2016 that the Project had been released from the EA review process, subject to a number of associated terms and conditions. These included the following:

Prior to the commencement of construction activities, the proponent must submit to Health Canada an inventory of all regulated substances that are intended to be used for the project...

The preparation and submission of this document is intended to address the above noted condition of EA release for the Project.

The Table below provides a list of substances, agents or chemicals that will or may be used by Grieg as part of this Project. This includes information on the names and types of substances to be used (both approved and a number which are still under development), their purpose and the specific aspect of the operation in which they will be utilized (including those which will be used regularly and routinely, and others that may be required in particular circumstances, such as in the event of fish health issues). It also provides an estimate of the likely quantities / rates at which each product may be used.

It should be noted that this information reflects the current stage of Project planning and design, and may therefore be subject to further refinement as these aspects of the Project continue to progress. Should there be material changes to this information as Project design and implementation move forward, Grieg will provide an update to the relevant regulatory authorities, either directly or in the context of future Project-related permitting.



Project Stage / Purpose	Substance	Estimated Quantity / Rate of Use (Preliminary Estimates)
<i>Freshwater Systems</i>		
<i>Cleaning and Disinfection</i>	a) Dawn™ -- soap	Used primarily for “cleaning” under CFIA quarantine for reportable diseases in freshwater applications. Emergency use only.
	b) Ovadine™	Used in small quantities for accepting eyed eggs from another facility. Used as a disinfectant under CFIA quarantine for freshwater systems. Usage rate is 100 ppm or 100 parts freshwater to 1 part Ovadine.
	c) Hypochlorite	Can be used as a freshwater only disinfectant. Not likely to be used.
	d) Virkon™	A disinfectant for freshwater applications and capable of managing viruses as well as bacteria. This is used daily in footbaths in freshwater facilities for biosecurity. Usage rate is 100 ppm or 1-liter freshwater to 10 grams of Virkon. Estimate 1000 grams per day.
<i>Saltwater Systems</i>		
	a) Greenworks™ -- detergent	Used primarily for “cleaning” under CFIA quarantine for reportable diseases in saltwater applications. Emergency use only.
	b) Iodophor™ -- free iodine and detergent	Used in small quantities for accepting eyed eggs from another facility. Used as a disinfectant under CFIA quarantine for saltwater systems. An emergency use only. Iodophor is also used in day to day applications for foot baths and general equipment disinfection. Under day to day circumstances 1 liter per day per site would suffice. Usage rate is 100 ppm or 100 parts water to 1 part Iodophor. Contact time for a 100 ppm solution should not be less than 10 minutes and the solution should only be used once.
<i>All systems neutralizing agent</i>		
	a) Sodium thiosulphate	Sodium thiosulphate chelates halide species as used in disinfection above. Neutralization is by colour titration from purple to clear. This is used in day and emergency use applications to neutralize free iodine compounds after



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		they are spent. 100 grams per day per site would suffice.
Sterilization and surfactant (live fish water)	a) Ozone gas	Ozone is created onsite via electrical corona arc in pure dry oxygen. It can be used for disinfection or water sterilization, cleaving heavy organics at Sulphur bond, double bonds and triple bonds. The land facility use will be to cleave large organic compounds including any pheromones, hormones produced by the fish and residual geosmin produced by bacteria. The usage will be continuous but at a very low rate on the waste water return line and less than 1% of total facility water flow.
Vaccines Prescription Only	a) Forte™ (Novartis) oil emulsion with 4 antigens for various <i>Vibriosis</i> (<i>Ordalii</i> , <i>anguilarum</i> , <i>salmonicida</i>) and one <i>Furunculosis salmonicida</i> (held at the freshwater facility only and applied there via injection) b) Renogen™ <i>Rheinobacterium salmonicida</i> (Bacterial Kidney Disease) vaccine (held at the freshwater facility only and applied there via injection) c) Infectious Salmon Anemia (ISAv) vaccine * d) Sea lice vaccine * e) Noda virus vaccine (cleaner fish application)	Each fish is given an injectable dose of 0.05 ml for 7,000,000 doses. Fish will be anaesthetized prior to administering the injection. Injections will occur intraperitoneally one fin length ahead of the pelvic fins along the midline. Food will be withheld from the fish 48 hours prior to vaccination. Injectable at 0.1 ml per fish. No planned use. May be required should the system become infected with BKD. If used, fish will be anaesthetized prior to injection of the vaccine intraperitoneally along the ventral midline, one fin length cranial to the pelvic fins. Injectable at 0.1 ml per fish. No planned use. May be required should ISAv become prevalent in Placentia Bay. This vaccine is still in the development stages but would be an important support to sea lice management. No planned use. May be required for the cleaner fish <i>Cyclopterus lumpus</i> should Noda virus become prevalent in Placentia Bay.
Antibiotics (prescription only use in both freshwater and saltwater	a) Oxytetracycline (in feed and feed surface application)	Broad spectrum antibiotic (effective for both gram positive and gram negative infective bacteria). It can cross cell membrane for effective use with intracellular infective agents as well as



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<i>applications)</i>		intercelluar. Emergency use only and by prescription by a licensed veterinarian. No planned usage.
	b) Romet / trimetrophin (in feed and feed surface)	Effective with intercellular gram negative bacteria. Emergency use only and by prescription by a licensed veterinarian. No planned usage.
	c) Aqua-flor (in feed and feed surface)	Broad spectrum antibiotic (effective for both gram positive and gram negative infective bacteria). It can cross cell membrane for effective use with intracellular infective agents as well as intercellular. Emergency use only and by prescription by a licensed veterinarian. No planned usage.
<i>Antifoulant (saltwater applications / nets /vessels)</i>	a) Flexguard™ (greater than 400 ppm copper base)	This compound is used as a paint on nets and other submerged marine equipment to inhibit fouling organisms. At concentrations > 400 ppm it is considered a pesticide. No planned usage.
<i>Anti-ectoparasitic (prescription only)</i>	<i>Saltwater Systems</i>	
	a) Slice™ (in Feed) – Emamectin benzoate	Recommended dose rate is 50 µg/kg of fish biomass per day for 7 consecutive days. Suggested feeding rate for medicated feed = 0.5% of total weight of fish per pen. If the feeding rate differs from 0.5% biomass/day, then the concentration of SLICE in feed must be adjusted proportionately. For 1,000 kg of fish administer: 5.0 kg of medicated feed per day / 35.0 kg per week. Emergency use only and in feed treatment of sea lice and by prescription by a licensed veterinarian. No planned usage.
	b) Calicide™ (in Feed) -- Teflubenzuron	Recommended dose rate is 2 grams per kg of fish feed for 7 days. Emergency use only and in feed treatment of sea lice and by prescription by a licensed veterinarian. No planned usage.
	c) Salmosan™ (Bath)	Fish affected by sea-lice should be bathed in 0.2 ppm the product (0.1 ppm azamethiphos) for a period of not less than 30 minutes and not more than 60 minutes. Emergency use only and in



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		feed treatment of sea lice and by prescription by a licensed veterinarian. No planned usage.
	d) Hydrogen Peroxide (Bath)	Fish affected by sea-lice or amoebic gill disease (AGD) should be bathed in (1500 mg/L) for 20 minutes. Treatments are administered daily or on consecutive alternate days for three treatments. Emergency use only and in feed treatment of sea lice and by prescription by a licensed veterinarian. No planned usage.
<i>Freshwater Systems</i>		
	a) Parasite-S™ (Formalin)	Formalin is a 37% solution of formaldehyde gas in water stabilized with 10% methanol. Formalin is used at 250 ppm for 30 to 60 minutes in a static bath with vigorous aeration for control of Saprolegnia (fungus). Emergency use only and in treatment of BGD and by prescription by a licensed veterinarian. No planned usage.
Anti-endoparasitic (prescription only)	<i>Freshwater and Saltwater (in Feed)</i>	
Anesthetic (prescription only)	a) TMS (MS – 222) {3-aminobenzoic acidethyl ester methanesulfonate}	General anaesthesia use for fish handling during vaccination and other examinations. The recommended dosage is 100 ppm for 90 seconds in water that does not exceed 10°C (50°F). Saltwater is not buffered but freshwater is buffered with sodium bicarbonate to a pH of 7. Available only by prescription from a licensed veterinarian. 10 kilograms per year should suffice.
Preservative (containment)	a) Formic Acid (Organic food grade acid)	Formic acid is used to maintain a pH of 3.0 with fine ground mortalities to neutralize microbial activities and permit internal digestive enzymes liquefy the mass. This is termed silage and the stabilized material is then fit for transport with control to be used as material for composting or fertilizer.
Probiotics (in feed imunostimulants)	a) Betaglucans	Yeast cell extracts included in functional feeds to aid immune response in salmon during periods of



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		stress. Typical inclusion rates can be 1% of the diet.
<i>Fish feed complete salmonid diets</i>	a) Health Canada Scheduled ingredients for animal feeds cross referenced to salmonids	These are extensive ingredient Schedules and animal cross referencing Schedules for permitted ingredients in animal diets in Canada. http://laws-lois.justice.gc.ca/eng/regulations/SOR-83-593/page-11.html
* Substance under development		