

**NOVA SCOTIA AQUACULTURE REVIEW BOARD**

IN THE MATTER OF: *Fisheries and Coastal Resources Act, SNS 1996, c 25*

- and -

IN THE MATTER OF: An Application by KELLY COVE SALMON LTD. for a boundary amendment and two new finfish aquaculture licenses and leases for the cultivation of Atlantic salmon (*Salmon salar*) – AQ#1205x, AQ#1432, AQ#1433, in Liverpool Bay, Queens County

**Rebuttal Affidavit of David Richards affirmed on February 16, 2024**

I affirm and give evidence as follows:

1. I am David Richards, PEng, of Saint John New Brunswick. I am a professional engineer and Mechanical Systems Manager with Fundy Engineering.
2. I have personal knowledge of the evidence affirmed in this affidavit except where otherwise stated to be based on information and belief.
3. I state, in this affidavit, the source of any information that is not based on my own personal knowledge, and I state my belief of the source.
4. I have received the Affidavit of Brian Muldoon affirmed on January 18, 2024 and filed in this proceeding on behalf of the Intervenor Protect Liverpool Bay Association.
5. Kelly Cove Salmon (“**KCS**”) has requested my independent expert opinion on Mr. Muldoon’s evidence respecting noise, with particular attention to Mr. Muldoon’s use of a smartphone application to measure sound levels coming from KCS’s operations at its Coffin Island farm.
6. My independent expert opinion on Mr. Muldoon’s evidence is attached as **Exhibit A**.
7. My CV was previously filed in this proceeding and is located at Exhibit B of my Affidavit affirmed on January 19, 2024.

**AFFIRMED** before me in Saint John, New Brunswick, on February 16, 2024.

[Redacted]

[Redacted]

New Brunswick Commissioner

David Richards, PEng



**KCS Application re AQ#1205X, AQ#1432,  
AQ#1433 in Liverpool Bay, Queens County**

This is **Exhibit A** referred to in the Affidavit  
of David Richards, affirmed before me  
on February 16, 2024.



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New Brunswick Commissioner of Oaths

Mr. Jeff Nickerson  
Kelly Cove Salmon Ltd.

██████████  
██████████  
Bridgewater, Nova Scotia  
B4V 2V6

Project File: 16672  
15 February 2024

**RE: Liverpool Aquaculture Marine Grow-Out Site Sound Study  
Response to the Affidavit of Brian Muldoon**

Mr. Nickerson:

Kelly Cove Salmon Ltd. contracted Fundy Engineering & Consulting Ltd. (Fundy Engineering) to review and provide a response to the Affidavit of Mr. Brian Muldoon. Mr. Muldoon's Affidavit is with respect to the Applications by Kelly Cove Salmon Ltd. (Kelly Cove). Kelly Cove's application is for a boundary amendment and two new marine Finfish Aquaculture Licenses and Leases (AQ#1205x, AQ#1432, and AQ#1433) for the cultivation of Atlantic Salmon (*Salmo salar*). The three sites are in Liverpool Bay, Queens County, Nova Scotia.

Mr. Muldoon's sound level readings shown in Exhibits O, Q, and T of his Affidavit were recorded using the Apple iPhone application, *Decibel Meter Sound Detector*. Mobile phone applications can provide a simple and cost-effective method for measuring sound power levels; however, their accuracy varies by device, the device's microphone condition, and the specific application used. For the *Decibel Meter Sound Detector* application, Apple's *App Store* states that the application is:

*limited to the device microphone capabilities. Therefore, it is not recommended to use this app as a high-quality, professional-grade meter.*

It is important to note that a smartphone is not a calibrated sound measurement device. Furthermore, the smartphone application's accuracy is unknown in the absence of performing calibration testing. A summary of the readings provided in Mr. Muldoon's Affidavit are included in the table on the following page. Kelly Cove Salmon Ltd. provided Fundy Engineering information regarding their site operations on the dates of Mr. Muldoon's sound measurements. That information is also included in the table.

Screenshots from the Apple iPhone application named *Decibel Meter Sound Detector* provided in the Affidavit of Mr. Muldoon indicate that Z-weighting was used. Z-weighting is a flat frequency response between 8 Hz and 20 kHz. That is the actual sound that is made with no weighting to account for peculiarities of human hearing. An A-weighting filter, which is the standard for sound monitoring in this application, de-emphasizes low frequency sound levels because they are not audible to the human ear. A-weighting is required for Canadian occupational health and safety sound level measurements and limits.

Screenshots provided from the *Decibel Meter Sound Detector* show the application's output for the sound level when the screen shot was taken. The screenshots also show the maximum sound level, average sound level, and peak frequency at the time the measurement period was started until the moment the screenshot was taken. Sound levels at low frequencies, which the human ear has reduced ability to perceive as sound levels, were included in the Z-weighted measurements made by Mr. Muldoon's iPhone application. This is inappropriate. For example, a sound power level of 88 dB(Z) at 129 Hz would have an A-weighting sound level of about 72 dB(A). That A-weighting sound level is what the human ear would perceive, not the Z-weighted, so it is only appropriate to use an A-weighted sound level in this application.

Affidavit Exhibit Reference:	'O'	'Q'	'T'
Stated Date:	29 June 2021	12 August 2021	18 June 2022
Application Sound Level:	83 dB(Z)	86 dB(Z)	86 dB(Z)
Application Maximum Sound Level:	88 dB(Z)	90 dB(Z)	91 dB(Z)
Application Average Sound Level:	84 dB(Z)	82 dB(Z)	77 dB(Z)
Application Peak Frequency:	129 Hz	113 Hz	161 Hz
Estimated Time of Measurement:	Prior to 9:30 AM based on time stamp of email	Unknown	Unknown
Weather Conditions at 8am*:	15.5°C, 8km/hr from 220° (~SW)	16.8°C, 6km/hr from 240° (~WSW)	10.9°C, 16km/hr from 200° (~SSW)
Weather Conditions at 12pm (Noon)*:	17.0°C, 9km/hr from 210° (~SSW)	19.6°C, 17km/hr from 190° (~S)	12.5°C, 7km/hr from 190° (~S)
Weather Conditions at 6pm*:	17.6°C, 3km/hr from 80° (~E)	16.2°C, 19km/hr from 200° (~SSW)	13.4°C, 15km/hr from 250° (~WSW)
Kelly Cove Salmon Ltd. Reported site Operations:	Net wash vessel was on site and in use from 7:20AM-2:15PM	Net wash vessel was on site and in use from 7:55AM-3:00PM	Feed delivery barge (barge delivering food to stationary barge) was on site from 4:00AM-11:59PM
*Weather conditions recorded at Environment Canada's Western Head Station near the Liverpool, Nova Scotia aquaculture marine grow-out site			

Based on the limited information provided to Fundy Engineering, we are unable to comment on the sound level measurements across the frequency spectrum provided in Mr. Muldoon's Affidavit; however, because the peak frequencies were in the lower frequency range, we can infer that the average perceived human sound level (A-weighted) would be reduced compared to the Z-weighted measurements provided. Although the sound levels would be reduced, we are unable to comment on the extent of the reduction with the limited information available.

We were asked if we could relate our sound measurements previously made to those in Mr. Muldoon's Affidavit. Because Fundy Engineering representatives were not present when Mr. Muldoon made his measurements, we are unable to comment on the sources that may have contributed to the sound level he recorded (e.g., activities at the aquaculture site, waves action, vehicle traffic, birds, people conversing, etc.). Nor were we aware of the settings and calibrations entered by Mr. Muldoon while using the iPhone *Decibel Meter Sound Detector* application.

In reviewing site operations, the sound level measurements recorded by Fundy Engineering at the Horse Head Rock site on 25 July 2023 are the most comparable to Mr. Muldoon's. At that time, as noted in our report, the feed barge generators were operating, and net washing was being undertaken. Environmental conditions were like the conditions when Mr. Muldoon made his measurements with winds being 12km/hr from 210°. To further demonstrate the difference between A-weighting and Z-weighting, we selected the peak sound level recorded during our measurement period on 25 July 2023 at the Horse Head Rock Receptor site. At 9:03:06AM, the peak frequency was 302 Hz and the  $L_{eq,15}$  was 58.3dB(A) which translates to 66.8 dB(Z).

On 25 July 2023 the average sound level measured at the Liverpool grow-out site feed barge was 81.4dB(A). We have calculated what the sound levels emitted from the feed barge generators would most likely have contributed to sound levels at two receptor locations. Horse Head Rock is approximately 980m from the feed barge and Mr. Muldoon's residence is approximately 720m from that same feed barge. It is estimated that the contributed sound level as a result of the feed barge would have been 31.1dB(A) at the Horse Head Rock site and 33.8dB(A) at Mr. Muldoon's residence.

The sound levels provided in Mr. Muldoon's Affidavit are considerably higher than the measurements recorded by Fundy Engineering at the Horse Head rock site. The difference in distance between the Liverpool grow-out site and Mr. Muldoon's residence and the Horse Head Rock receptor site (260m) is too minimal to account for the sound level differences. On 25 July 2023 the peak sound level measured on the stern of the feed barge was 82.4dB(A) or 87.7dB(Z). The peak sound levels included in Mr. Muldoon's Affidavit exceed the sound levels recorded by Fundy Engineering on the feed barge. With the limited information available, Fundy Engineering is unable to provide an explanation for the discrepancy in the measurements.

We have recently been informed by Kelly Cove Salmon Ltd. that the configuration of their net wash vessel equipment had changed in January 2023, prior to the sound monitoring carried out by Fundy Engineering. The net Wash vessel, named MV Lady Jeanette is equipped with a Remote Operated Net Cleaner (RONC). The RONC consists of a diesel engine driving a high-volume water pump, the Remote Operated Vehicle which uses the high-volume water to remove bio fouling from the net as the operator guides it around the net. In the past, this diesel engine and pump was on the deck of the vessel. In January 2023 the vessel reportedly underwent a refit which resulted in the diesel engine and pump being placed in a noise attenuated compartment under the deck. The sound measurements recorded by Fundy Engineering included this vessel with its retrofitted equipment configuration. This change in equipment configuration may provide a plausible explanation as to some of the discrepancy in the measurements between those included in Mr. Muldoon's Affidavit and those of Fundy Engineering.

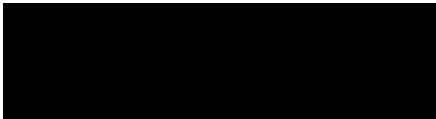
Kelly Cove Salmon Ltd. has also informed Fundy Engineering of a supplemental oxygen system which is used onsite during periods when ambient dissolved oxygen levels decrease during the summer of the second year of the grow-out period. A series of sensing probes in the cages reportedly engage the equipment when oxygen levels drop and shut the equipment off when not needed. The equipment reportedly consists of a 40' barge with equipment on deck. This equipment includes two 20' sea containers with internal oxygen generators and a diesel generator with sound attenuation. This barge was not onsite during the sound monitoring carried out by Fundy Engineering, and the sound levels emitted by the equipment has not been measured.

Sounds levels below 70dB(A) pose no known risk of human hearing loss (i.e., threshold for non-hazardous sounds), no matter how long a human listens; however, when sound levels increase, the daily listening time becomes an important risk factor for hearing loss. Generally, the louder the sound, the less time it takes to pose risks to human hearing. Therefore, occupational health and safety sound exposure limits have been established in Canadian jurisdictions; limits after which noise induced human hearing loss can occur. The exposure limits over an eight-hour period range from 85dB(A) to 90dB(A). The federal maximum permitted exposure level for eight hours is 87dB(A). The Nova Scotia maximum permitted exposure level for an eight-hour period is 85dB(A).

The sound levels provided in Mr. Muldoon's Affidavit were Z-weighted and do not provide information of the sound levels across the frequency spectrum. Therefore, Fundy Engineering does not have sufficient information to comment on if the sound levels provided exceed the exposure threshold for the possibly of damage to human hearing. The measurements recorded by Fundy Engineering on July 25, 2023 in circumstances most similar to those described by Brian Muldoon in his affidavit were at levels which pose no known risk of hearing loss at the onshore receptor measurement locations outlined in our report.

We trust this information is sufficient for your present needs. We would be pleased to provide additional information or clarification concerning the enclosed upon your request.

Regards,



David Richards, P.Eng., MBA  
Fundy Engineering & Consulting Ltd.