

## Underwater Noise Impacts from Remediation Dredging: Best Practices and Mitigation Alternatives

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Mitigating the impacts of human activities on Canada's marine environment is vital to protecting our freshwater aquatic species and their habitats. Noise has long been identified as an environmental impact during the remediation of contaminated soils and sediments. However, when these remedial activities occur in water, there is a much higher probability of a noise impact, as sound travels 4.4 times faster in water than in air. Dredging is a commonly used remedial method for contaminated sediment removal and research has shown that even at low intensities, continuous noise activities from dredging can lead to cumulative noise impacts on sensitive freshwater aquatic species.

The impacts of underwater noise can affect individual species or entire populations differently, but underwater noise has been linked to a wide range of impacts on fish species, including disrupting their normal behaviour; change or loss of their habitat; masking sounds; changes in their physiology and/or stress levels, and permanent injury or even death. Canada currently does not have any federal statutes specifically designed to address underwater noise; instead, Fisheries and Oceans Canada regulate the impacts of underwater noise on specific groups of aquatic species, including fish. Best practices recommend noise thresholds of 150 dB re 1 $\mu$ Pa of root mean square pressure for adverse behavioral effects on fish; and 187 dB re 1 $\mu$ Pa<sup>2</sup>-sec of cumulative sound exposure level for physical injury on fish.

There are several mitigation initiatives that address the problem of underwater noise associated with dredging. Pre-remedial activities may include the use of a sound transmission loss modeling study to generate exclusion zones, action protocols, and seasonal restrictions to prevent the ensouffication of sensitive fish species and habitats. Mitigation during remediation can include such activities as the proper maintenance of the propeller blades, damped engine mounting and vessel speed reduction. To mitigate the noise propagation through water, air bubble screens may be used. To avoid exceeding noise thresholds, passive acoustic monitoring is recommended for the entire time dredging operations are being undertaken.

SLR's underwater acoustics team with expertise in noise propagation modeling and passive acoustic monitoring will share some mitigation alternatives and best practices to establish baseline noise levels and conduct passive monitoring during remedial dredging activities in or near water.

### Jonathan Vallarta

Dr. Vallarta has nineteen years of underwater acoustics experience in a wide range of positions including teaching, design, project management, acoustic consulting, and collaborative research. He has considerable experience teaching training courses in underwater noise fundamentals and monitoring techniques. In 2018, his experience was recognized as a Mexican guest panelist and advisor at the United Nations in New York. He has a particular interest in marine conservation issues, especially in reference to threatened species, noise pollution and mitigation.