



Underwater Noise Impacts from Remediation Dredging

Best Practices & Mitigation Alternatives

RemTech 2022 (Banff) | October 2022

Jonathan Vallarta, PhD



Overview

Introduction

- Canada's Freshwater Ecosystems
- Endangered Fish Species

Remediation Dredging

- Dredging Types
- Noise Levels
- Noise Impacts

Best Practices

- Canadian Regulation
- Environmental Assessment

Mitigation

- Noise Monitoring
- At the Source
- Propagated Sound



Introduction



Canada's Freshwater Ecosystems

*Canada's freshwater systems are facing increasing pressure every day from **pollution, habitat loss, invasive species** and **climate change** – among other threats.*

- WWF

Endangered Fish Species

- **80 species** in the world have already been declared **extinct**
- **One third** of all freshwater fish species are threatened with **extinction** (-WWF)
- In Canada, **62 species** are considered **endangered**, including:
 - White sturgeon
 - Atlantic salmon
 - Pacific salmon



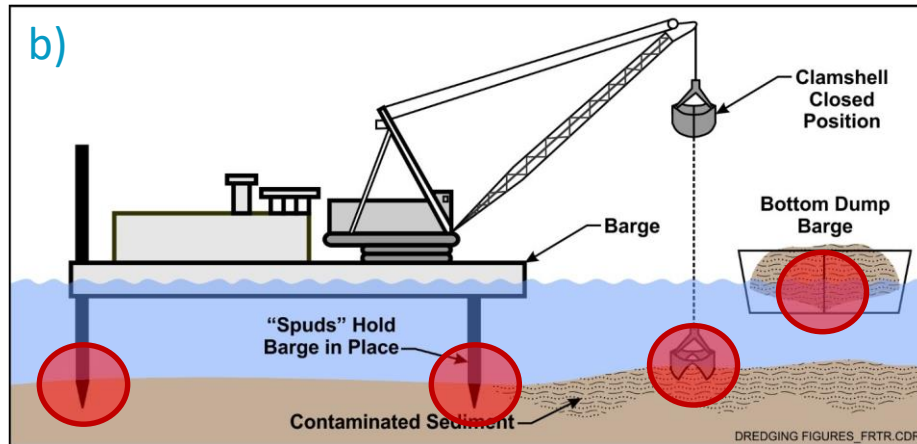
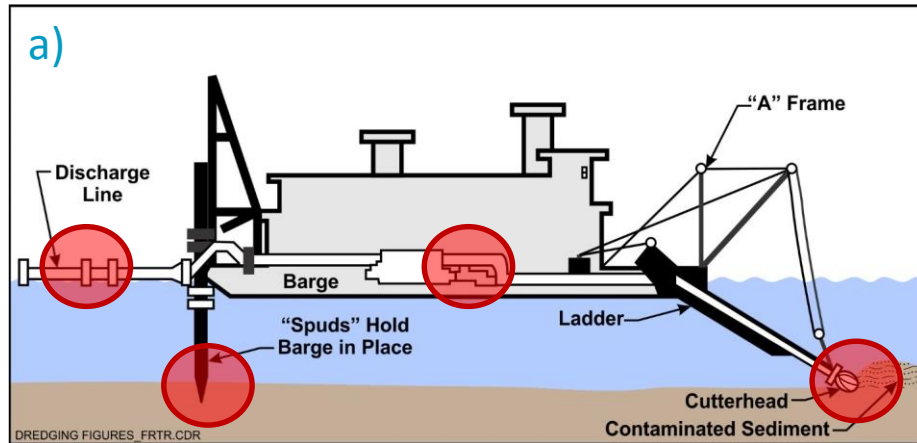
Remediation Dredging

Remediation Dredging

Dredging is a commonly used remedial method for contaminated sediment removal.



Dredging Types



source: <https://frtr.gov/matrix/Environmental-Dredging/>

The sounds generated by dredging varies by the type of dredge being used. The two main categories of dredges are:

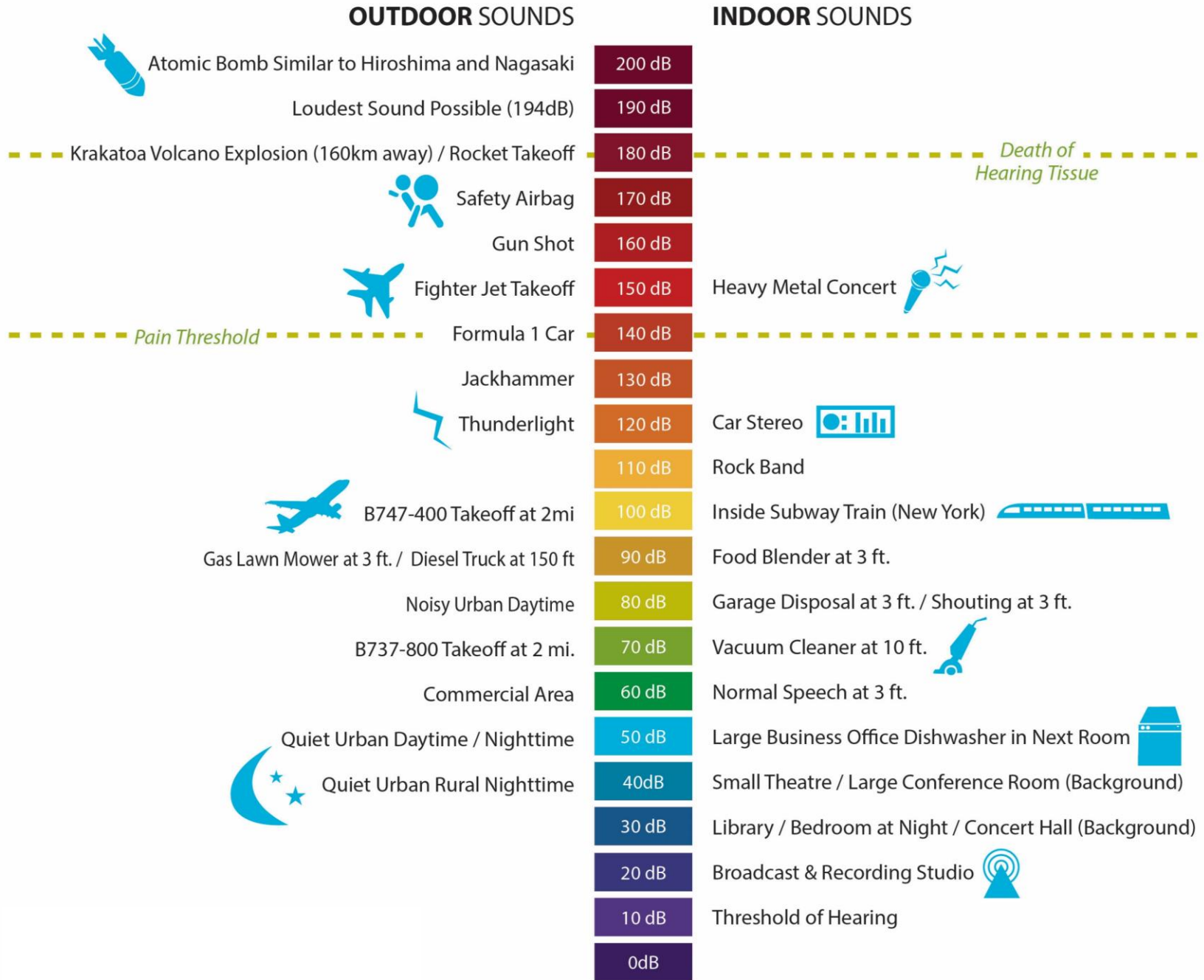
a) hydraulic

- Cutter Suction Dredge (CSD)

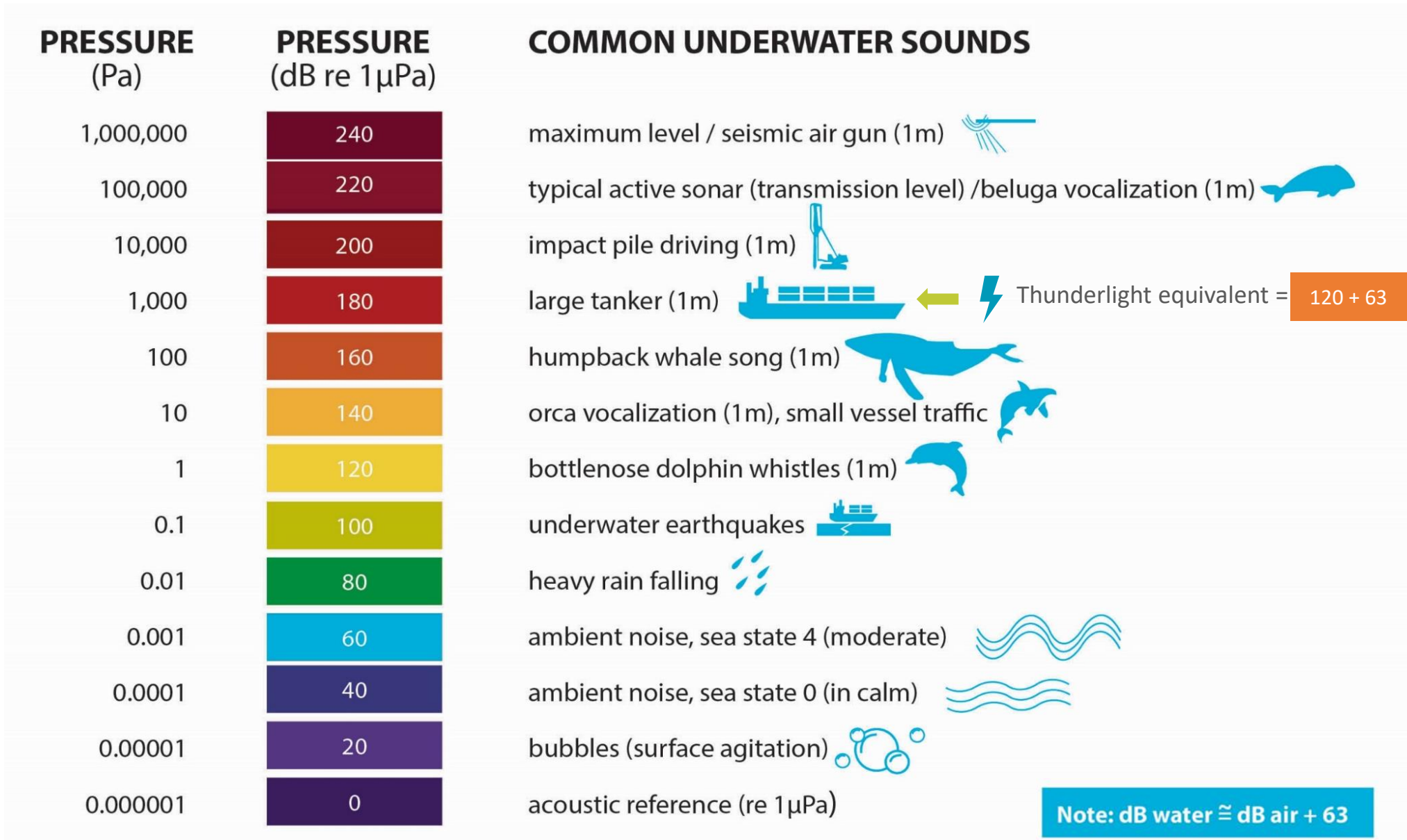
b) mechanical

- Grab Dredge (GD)

Comparative Noise levels



Comparative Noise levels

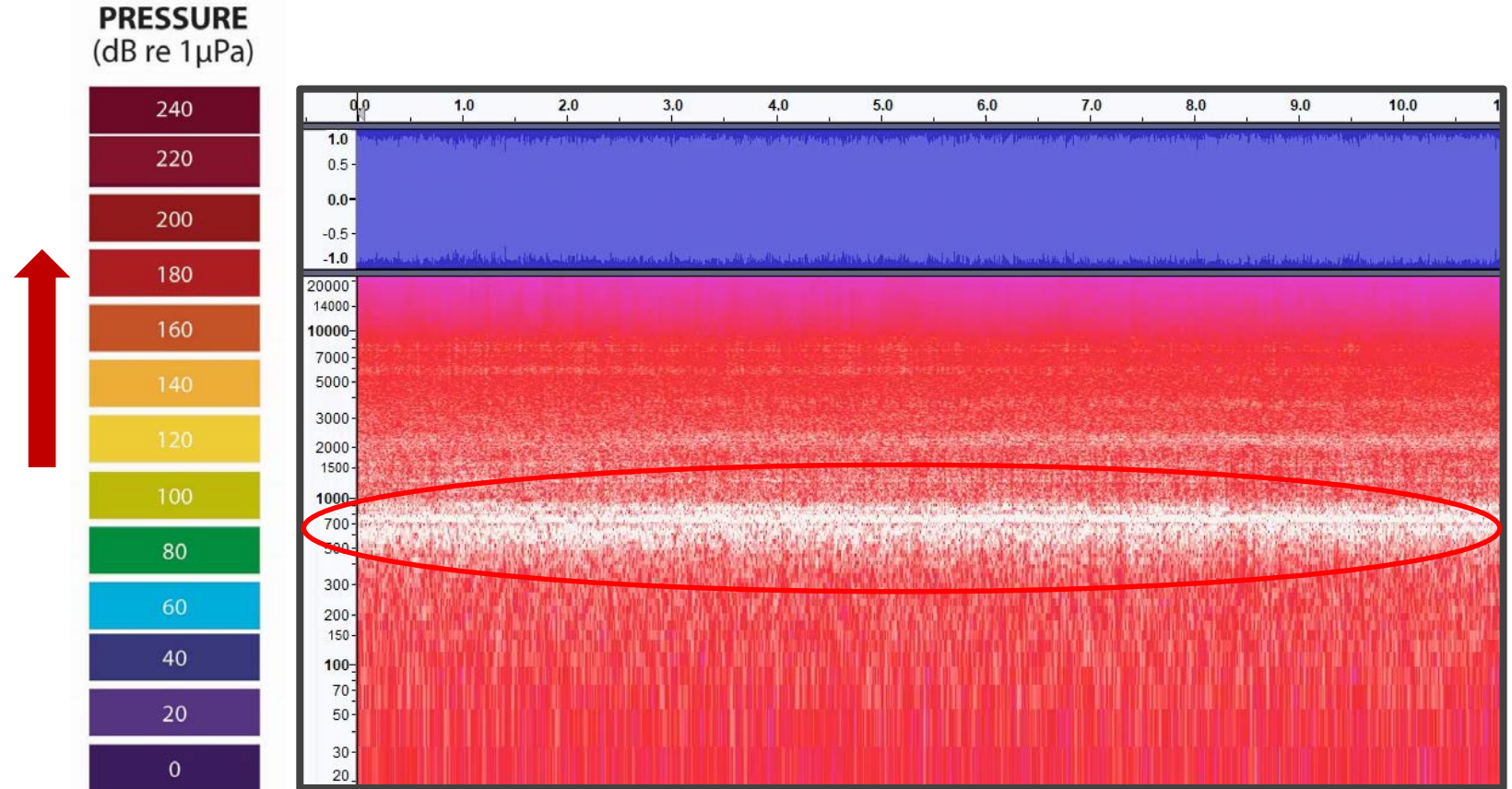


Note: dB water \cong dB air + 63

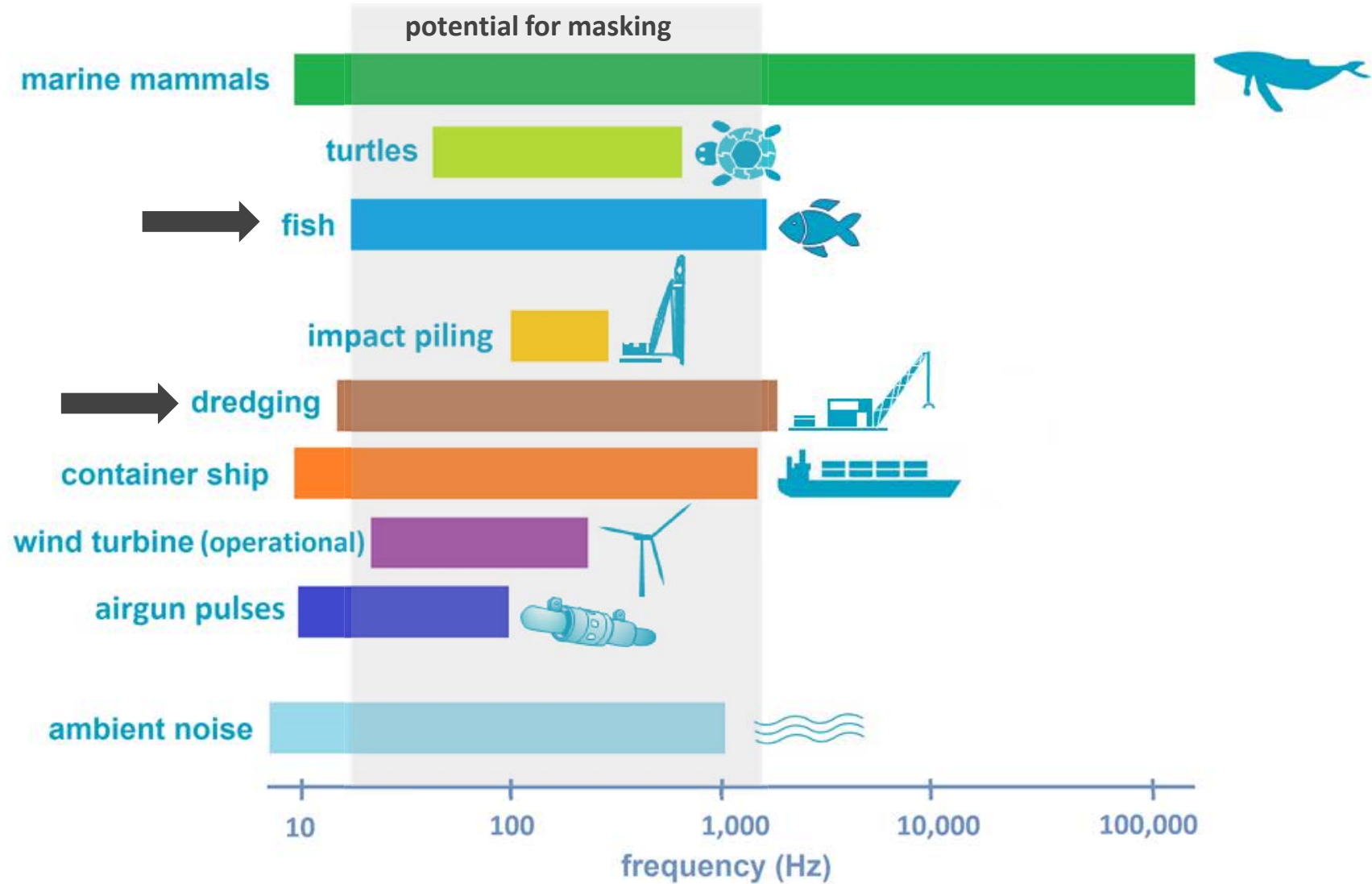
Dredging Sources

Dredging produces sounds which are non-impulsive, continuous, discontinuous, and/or cyclic in nature.

Sound Pressure Levels (SPL) occurring at the source (at 1 m) range from 107 to 190 dB re 1 μ Pa.



Underwater Noise Masking



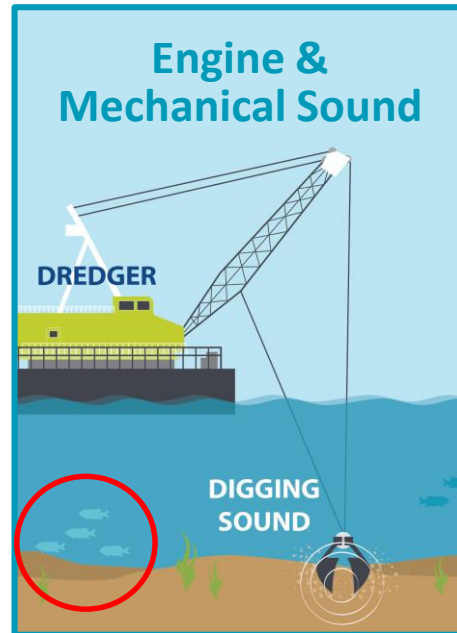
Underwater Noise Impacts



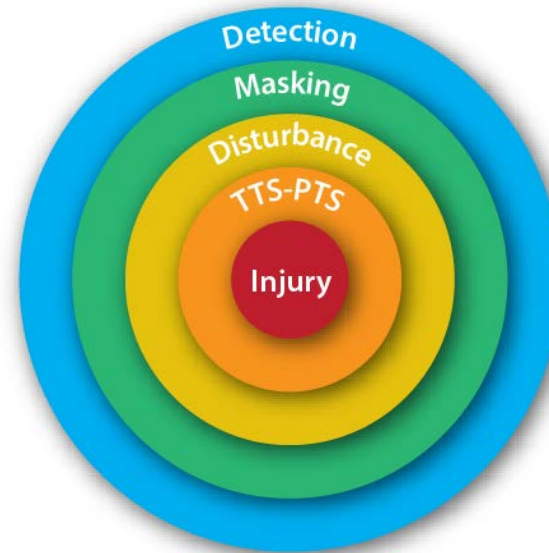
Salmon



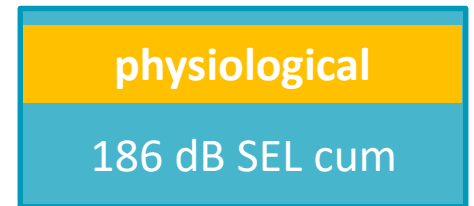
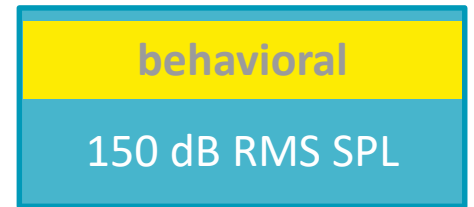
Sturgeon



Noise Impact



Noise Thresholds





Best Practices

Canadian Regulation

Department of Fisheries and Oceans (DFO) Canada

Fisheries Act

Species at Risk Act

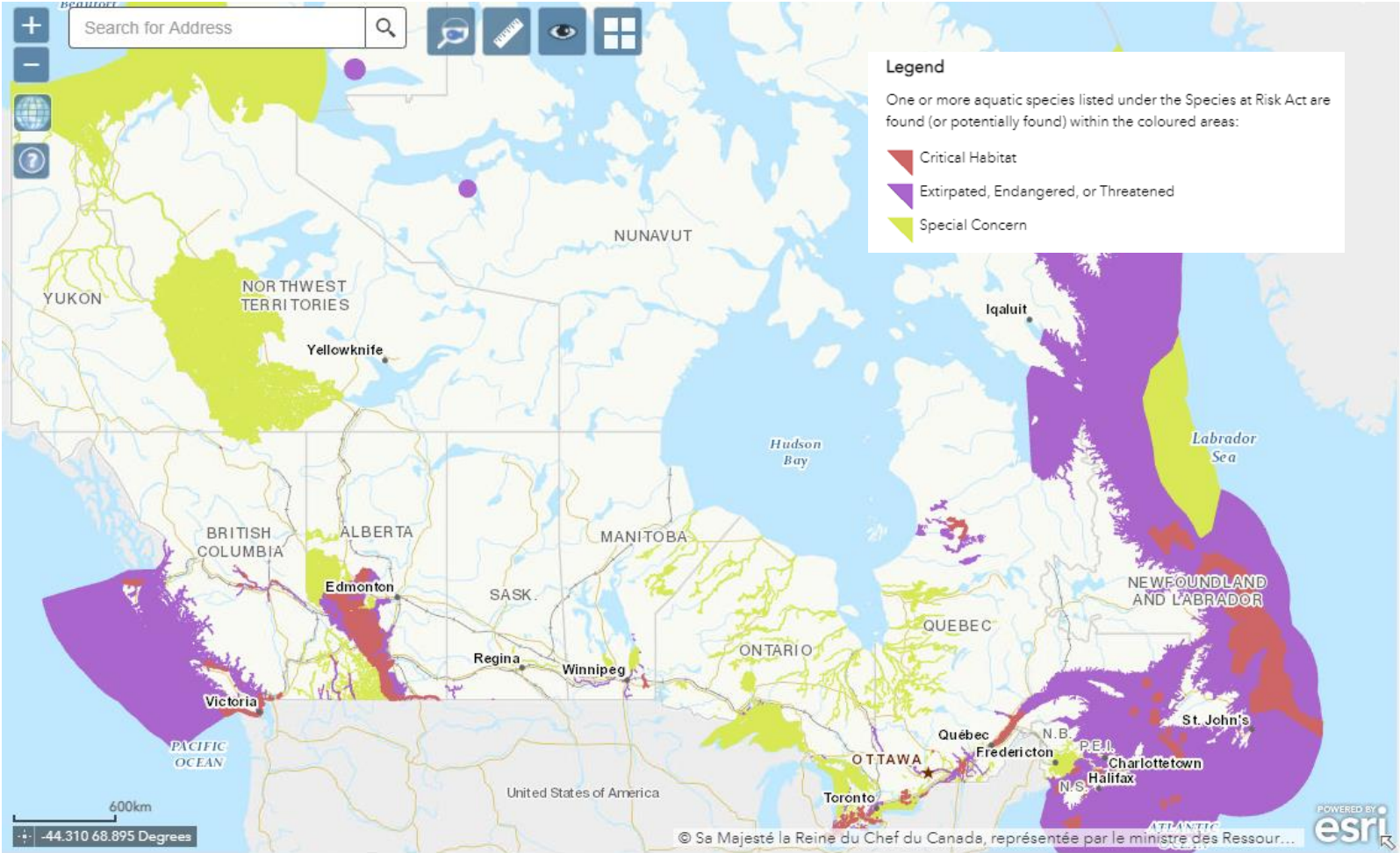
COSEWIC

— or —

SARA

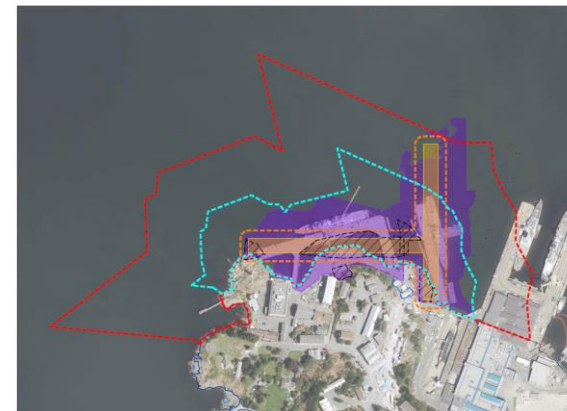
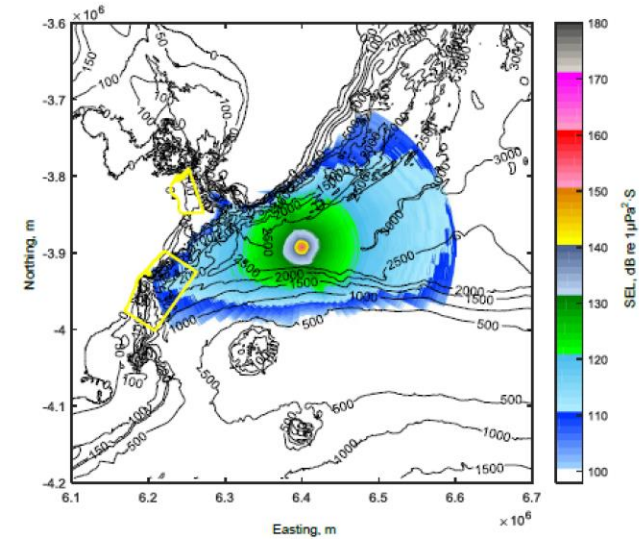
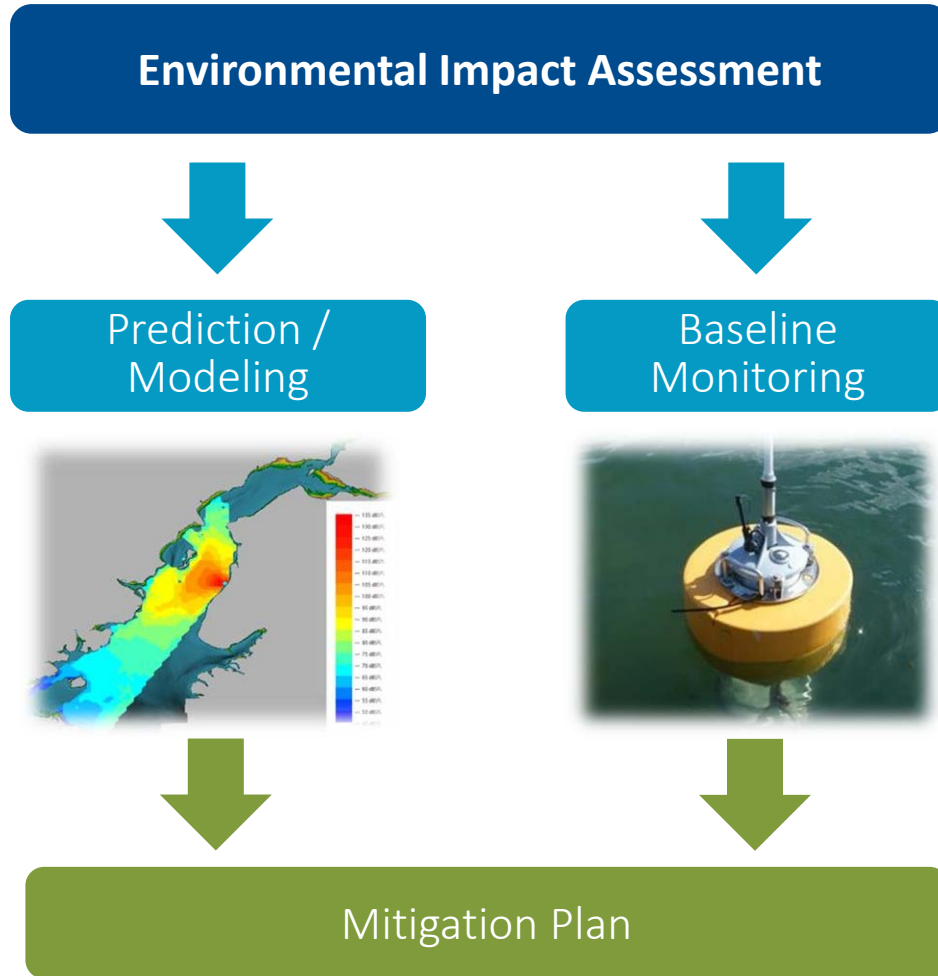
Schedule 1

Aquatic Species At Risk (SARA)



See [SARA map \(dfo-mpo.gc.ca\)](http://dfo-mpo.gc.ca) for more information

Environmental Impact Assessment

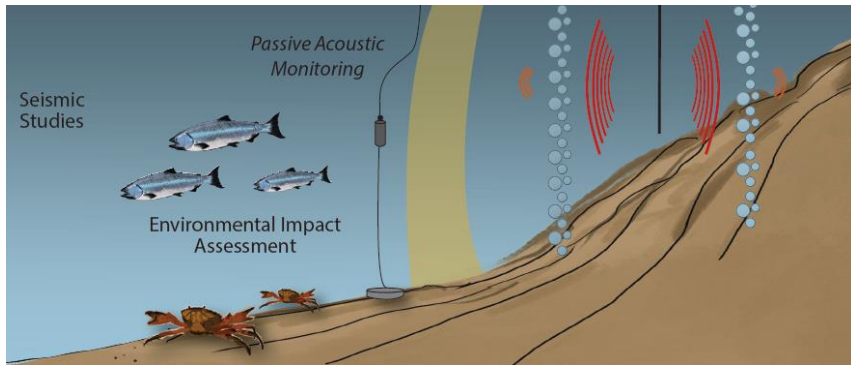
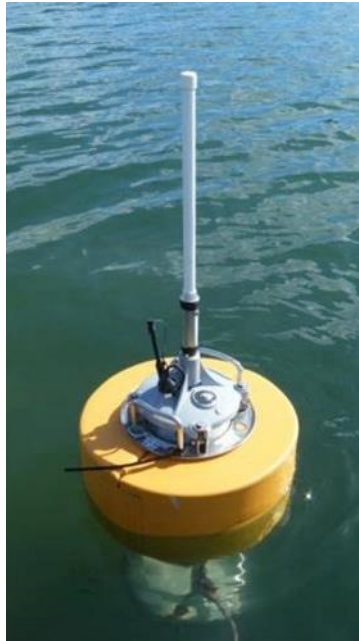


Mitigation

Underwater Noise Monitoring



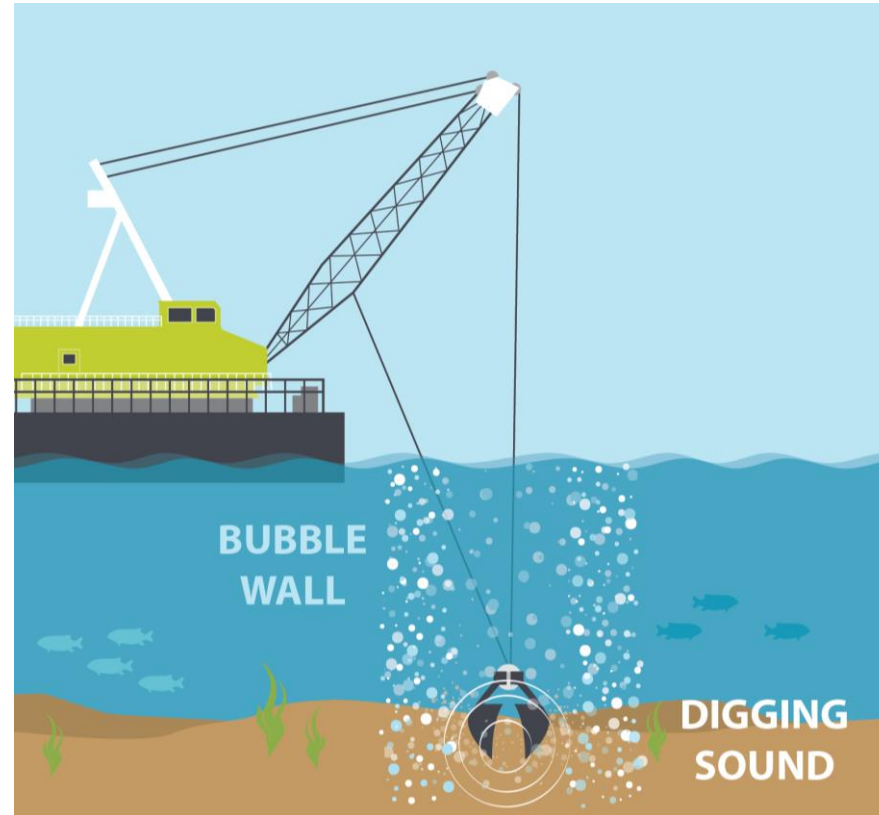
Passive Acoustic Monitoring (PAM)



Attenuation of the propagated noise

A bubble curtain may be installed at the bottom of the water column to avoid the carrying away of spoils from the operational area.

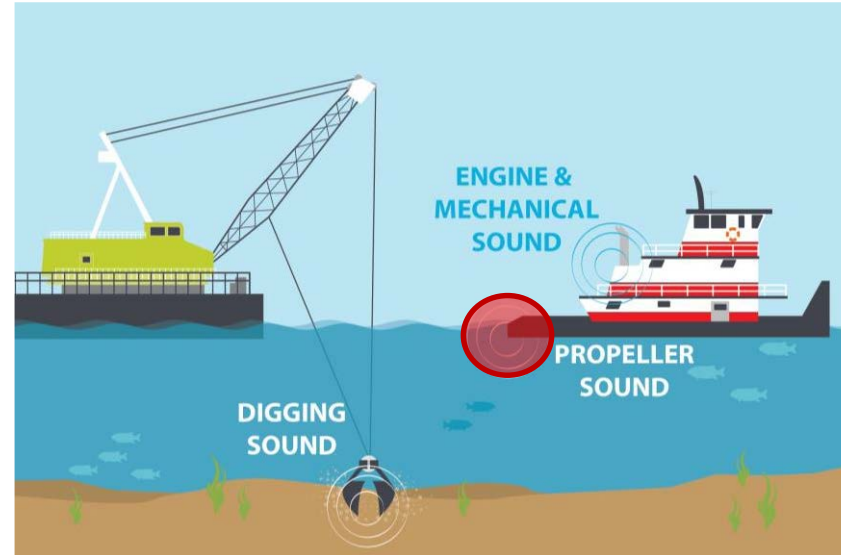
- A bubble curtain can either be designed as a **single, double or triple** curtain system.
- The **advantages** this noise mitigation system bring are:
 - prevent sediment from drifting
 - low noise during operation

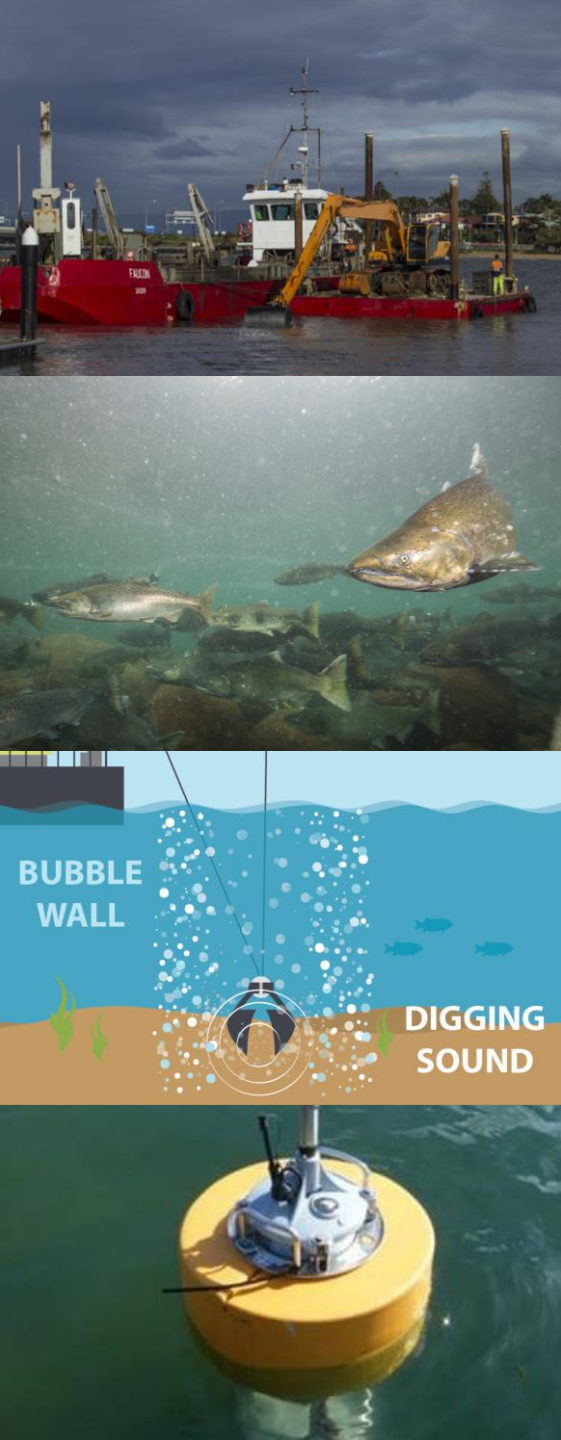


Attenuation of noise generated at the source

Ship propellers design for quieter vessels comprise:

- Optimized propellers
- Propellor Boss Cap Fins (PBCF)
- Propeller Wake flow field





Key Points

- **Remediation dredging** is a solution to improve water quality for both people and aquatic life.
 - A **best practice** is to look at the aquatic SARA map and see if, based on the location of the site activity, aquatic species could potentially be affected by remedial dredging activities.
 - If underwater noise **mitigation alternatives** are not applied, the collateral impacts could adversely affect freshwater ecosystems.
- Implementing an **environmental impact assessment** and developing a **mitigation & management plan** are critical for successful project delivery.

Thank you!

Questions?



Jonathan Vallarta, PhD

Underwater Acoustics Business Lead

t +1 604 240 1715

e jvallarta@slrconsulting.com

w www.slrconsulting.com