



Marine Mammals

Woodfibre LNG Limited understands the concerns expressed by Howe Sound residents and visitors about the potential for disruption to marine mammals' activities due to the Project.

The assessment of potential effects of the Project on marine mammals in Howe Sound is described in **Section 5.19** of the Application. The most common marine mammal species reported in the upper reaches of Howe Sound, closest to the Project area, are harbour seals, Pacific white-sided dolphins, and killer whales. Species that occur in Howe Sound that are listed under the *Species at Risk Act* (SARA) include killer whales, humpback whales, harbour porpoise, grey whales, and Steller sea lions.

Some cetaceans that have been mostly absent from Howe Sound over the last few decades have been sighted more recently. Pacific white-sided dolphins, killer whales, porpoises, grey whales, and humpback whales have all been sighted. This recent rise in sightings has been linked to improved water quality in the area and with an associated return in numbers of prey fish, such as herring and salmonids.

POTENTIAL EFFECTS OF THE PROJECT

Effects on marine mammals associated with the Project that were assessed included reduced prey availability, underwater noise disturbances from construction and shipping activities, and collisions between marine mammals and vessels.

No significant effects to forage fish are likely as a result of the Project, therefore any effect on marine mammals because of reduced prey availability due to the Project is considered negligible.

Marine mammals use underwater sound as a primary method of communication as well as for navigation and prey detection. Underwater noise has the potential to affect these critical activities. The potential effects range from subtle changes in behaviour to strong disturbance effects, including temporary or permanent hearing loss. These effects depend on a number of factors such as the nature of the noise produced and how the animal perceives or hears that noise. The age and status of the animal, and the type of activity or social context the animal is engaged in at the time of the noise are also important factors.

The main sources of underwater noise from the Project include impact driving of steel piles during construction, and operating noise from vessels used in construction and operation, including LNG carriers, worker ferries, barges and tugboats. Potential effects on marine mammals from the Project include potential injury or short-term changes in behavior due to underwater noise from pile driving, and short-term changes in behaviour due to vessel activities.

Woodfibre LNG Limited will retain an environmental consultant to perform underwater acoustic monitoring before, during and after Project construction. The underwater monitoring will collect underwater sound levels and marine mammal presence (e.g., of those species present, their frequency and seasonality). This will contribute further to baseline information for both underwater sound levels and mammal presence in the Project area and in the vicinity of the Project Site to monitor potential changes of marine mammals over time. Ship operators will also monitor for presence of marine mammals during all shipping activities so that interactions with marine mammals can be avoided. If a marine mammal incident occurs due to the Project, such as a ship strike, stranding, death, or distinct behavioural disturbance, information about the incident will be communicated to Fisheries and Oceans Canada (DFO).

MARINE MAMMALS OF HOWE SOUND

Toothed whales

1. Killer whales
2. Harbour porpoise
3. Pacific white-sided dolphin
4. Dall's porpoise
5. False killer whale

Baleen whales

6. Humpback whale
7. Minke whale
8. Grey whale

Pinnipeds

9. Steller sea lion
10. California sea lion
11. Harbour seal



MITIGATION MEASURES

Woodfibre LNG Limited will develop and implement an Underwater Noise Management Plan and a Marine Mammal Management Plan. These plans will include mitigation measures designed to address adverse effects and cumulative effects from Project-related underwater noise and marine traffic.

Underwater Noise Management Plan: This plan will be a part of the Marine Works Management Plan, and will be designed to mitigate potential mortality and behavioural changes to birds, fish, and marine mammals. The Underwater Noise Management Plan will reference DFO Best Management Practices for Pile Driving and Related Operations, and will contain the following measures:

- An Environmental Monitor will be responsible for monitoring underwater noise and potential effects to wildlife, and implementing corrective mitigation measures, if necessary. Underwater noise from the Project will be monitored so that proper measures can be quickly implemented, such as establishing safety zones if underwater noise levels exceed injury thresholds.
- Works in the marine environment will be conducted during the fisheries window specified by DFO (August 16 to January 31), unless otherwise agreed upon by DFO.
- Underwater noise from pile driving activities will be monitored to verify that it does not exceed 30 kPa at a distance of 1 m to 2 m from pilings. If it does, measures will be taken to reduce either the intensity of the sound or the way the sound is propagated. These measures will be chosen based on practicality and effectiveness, and might include installing silt or bubble curtains around the work area.
- Pile driving using a vibratory hammer will be used where practical and feasible, to minimize potential noise effects. This is because the underwater noise generated by vibrational pile driving is not as loud as noise from impact pile driving.
- Activities that generate multiple underwater noises will be minimized when practical.
- Where feasible, pile driving will avoid impacting hard substrates to prevent disturbance to fish habitat.
- When starting equipment, power will be built up slowly, using a “ramp-up” or “soft-start” technique. This will give adequate time for marine wildlife to leave the vicinity.

Marine Mammal Management Plan: This plan will focus on reducing vessel speeds and avoiding marine mammals. These are the main measures:

- LNG carriers and other deep-sea vessel will travel at no more than 8 to 10 knots when operating in the proposed LNG carrier route in Howe Sound, as well as in the worker ferry route and water taxi route between the Project site and Darrell Bay/Squamish Harbour.
- All Project vessels will follow established shipping lanes and navigation routes and will maintain a constant course and constant speed, to the extent practical, while in Howe Sound.
- Under no circumstances, other than an emergency, will vessels approach within 100 m of any marine mammal. If marine mammals approach within 100 m, vessel speed will be reduced and, if possible, cautiously manoeuvred away from the animal. If this is not possible, vessel speed will be reduced until the animal(s) move at least 100 m from the vessel, before speed is resumed.

Planning for Future Marine Traffic: Woodfibre LNG Limited will undertake additional planning to address potential interactions of marine traffic in the future. This will be done as part of the studies included in the Technical Review Process under TERMPOL Code of Recommended Standards for the Safety and Prevention of Pollution for Marine Transportation Systems and Related Assessment Procedures.