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For Te Runanga Papa Atawhai O Tāmaki Makaurau – Auckland Conservation Board

EPA Hearing for CRL Application 30 November 2018

Slide 1. Introduction

Slide 2. Importance of Hauraki Gulf as a marine mammal habitat

The Hauraki Gulf is internationally significant as a marine mammal habitat. High diversity and in abundance. 33 species of marine mammals observed in the Gulf, including dolphins, baleen whales, toothed whales, and seals. This includes species assessed as being Nationally Critical, Nationally Endangered, Nationally Vulnerable.

Slide 3. Importance of Hauraki Gulf as a marine mammal habitat

The abundance of marine mammals in the Hauraki Gulf is one of the reasons there is a burgeoning tourist industry around marine mammal watching, which is where a lot of these data of marine mammal sightings come from. The marine mammal observations in the Department of Conservation's database are concentrated in the central Gulf largely because of reported tourism vessel observations. Marine mammals may also be abundant in outer areas of the Gulf but we do not have the numbers of observers there.

I have overlaid what I believe are the likely routes to the dumpsite by the tug-barge duo from the indicated dredge sites in the region from the CRL application, i.e., Pine Harbour, Hobsonville, Sandspit, Half Moon Bay, Bayswater, Whitianga marinas and Ports of Auckland. Even if these routes are not quite correct, they demonstrate that to navigate from the dredge sites to the dump site involves traversing a significant region of marine mammal habitat.

The existing dumping approval has already facilitated many hundreds of transits to the dump site, this is proposed to potentially increase by up to five times under the application before you. This voyage takes 15 to 25 hours return according to the applicant, hence there is potentially significant increase of underwater vessel noise being introduced to key marine mammal habitat in the Hauraki Gulf.

Slide 4. Background on importance of underwater sound to marine mammals

Marine mammals, especially the cetaceans (whales & dolphins), are highly social animals. However, living in the underwater environment it is difficult to maintain social relationships using senses that we relate to such as sight, because it is impossible to see more than a few metres underwater. So

cetaceans have evolved remarkable underwater acoustic capabilities because sound carries a long way underwater. Cetaceans use sound to communicate with one another, find one another, echolocate, listen out for environmental underwater sounds, and stun prey with sonic blasts. They are highly varied in the types of sounds (especially frequencies) they can generate and detect. Generally, they have relatively sensitive hearing.

Humpback whale sound.

Slide 5. Human underwater sound effects on marine mammals

Vessels are the most common source of human-made underwater sound in the marine environment. It is the result of heavy machinery noise, water moving against the hull(s) and cavitation around the propeller – water vapour bubbles forming and collapsing. It tends to be intense (loud) and often has a lot of low frequency noise (low pitched sound).

Vessel noise has been shown to have a wide variety of impacts on marine mammals – disturbance of natural activities, attraction, avoidance, interference with feeding, changes in social behaviour, such as vocalising, as well as cumulative effects leading to population health effects. These impacts vary by sound source, location, and the species involved.

Vessel noise causes "masking" – which is the blocking of hearing by increased background noise. You probably have all experienced this in a busy noisy restaurant – you have trouble maintaining your socialising when you ca not hear the conversation of your friends and family.

Of concern to the Conservation Board, is given the significance of the marine mammal habitat and the potential for this dumping activity to impact marine mammals, scant regard was given to appraising or mitigating this potential in the application. The focus of the material presented in the application was largely in relation to the dumping activity itself and not the associated activities, such as vessel sound emissions.

While the vessel operation during transit to the dumpsite is conducted in a large part outside the direct authority of the EPA's jurisdiction (and partly within), the dumping activity itself gives rise to the need to transit to and from the site. Therefore, we would contend that this is an integral part of the environmental impact that any approval of this activity would generate, and therefore needs to be considered and adequately addressed by the applicant.

Slide 6. Background underwater noise in the Hauraki Gulf

By international standards the Hauraki Gulf remains relatively unpolluted by human-made underwater noise, despite the suggestion to the contrary by Dr Childerhouse in his evidence, which estimated the number of vessel movements from CRL would be a small contributor to overall vessel traffic (i.e., less than 1% of total vessel movements already occurring in the Hauraki Gulf annually). In

my view this is misleading data, as yachts, rowboats and many other vessels produce small amounts of noise, and many of the vessels do not leave the inner Gulf.

The inner Gulf is noisier underwater, partly as a result of more vessel noise. The outer Gulf is quieter. A recent study found that 35.2% of the underwater noise at Bean Rock in the inner Gulf was vessel noise, compared to just 1.9% at Horn Rock (between Hauturu and Aotea – Little and Great Barrier Islands) in the outer Gulf.

The Royal New Zealand Navy runs and underwater listening station on the eastern coast of Aotea (Great Barrier Island) and I understand the reason for originally siting it in the area was the low ambient sound levels in this area, especially from vessels.

Underwater sound is cumulative in the marine environment. The CRL vessels will be contributing to this background noise in an important marine mammal habitat. We do not know by how much as the applicant has provided no data on the underwater sound output of their vessels.

Slide 7. Vessel underwater noise in the Hauraki Gulf

Here are some underwater sound recordings produced by vessels operating in the Hauraki Gulf compared to the background noise. Overall, you can see they significantly increase the sound levels above and beyond the background noise.

Sound is additive in the marine environment. Each vessel has a different frequency range and the loudness varies across the range of frequencies. This can be important because marine mammals are often sensitive to a particular frequency range.

Slide 8. Tug and barge underwater noise in the Hauraki Gulf

We do not have data for CRL vessels, but from a few studies from overseas there is data for tugs towing barges -160 – 191.5 dB re 1 µPa @ 1m – marked on here in red (See supplementary evidence of Dr Childerhouse).

Slide 9. Tug and barge underwater noise in the Hauraki Gulf

We do not have data for CRL vessels, but if we take a vessel from a previous study with a similar sound output to tugs towing barges from a few studies from overseas (178 dB re 1 µPa @ 1m) and look at it for the Hauraki Gulf situation to see how far from the vessel a dolphin would be likely to hear the vessel, and

hence possibly disturbed by it. 990 m in the inner Gulf, 2800 m in the mid Gulf, and 3600 m in the outer Gulf.

Ranges for vessel noise masking the normal hearing of marine mammals will be less extensive because greater background noise is required to "drown out" the sounds of interest, such as a group member's call.

Slide 10. Bryde's whale underwater noise in the Hauraki Gulf

Just as an example, and because there is more data on this species than most others in the Gulf, we can look at the Bryde's whale. This species is assessed as Nationally Critical, and has a NZ population of around 250 whales of which about 50 live in the Gulf year round. They have had a hard time in the past from being struck and killed by fast moving vessels, not that this is a concern for CRL vessels provided speed limits are included in the conditions as recommended from the facilitated meeting of marine mammal experts.

Bryde's whales appear to be vulnerable to ship strike because they spend a lot of time near the surface of the sea, especially at night when they rest at the surface. They are sensitive to low frequency sound, same kind of noise that tends to be produced by heavy engine powered vessels, and there is some indication that they may get confused by vessel sound making them more vulnerable to being hit by fast moving vessels.

Slide 11. Bryde's whale underwater noise in the Hauraki Gulf

Here are the vessel tracks overlaid on recorded observations of sightings of Bryde's whales in the Gulf for 2000 – 2016. Over 90% of the CRL dumping occurs at night so there is the potential for disturbance of this important species that needs some careful consideration.

Slide 12. Underwater noise and other species in the Hauraki Gulf

Many other marine species use underwater sound for communication and other purposes. Here are two examples.

The nocturnal reef fish, bigeyes, hide in caves during the day and swim in schools to feed at night. They maintain their social cohesion as school by calling to one another continually. This behaviour has the potential to be masked by vessel noise.

The post-larval stage of crayfish swims in from the open ocean using the natural sounds coming off reefs as a directional cue to find their way to the reef where they set up home as a juvenile crayfish.

We know a lot less about the effects of human-made underwater noise on these kind of species, but evidence is growing that these species are acoustically sensitive and can be disturbed or impacted by human-made noises.

Slide 13. Options for DMC – CRL conditions?

It is challenging to determine an acoustic impact threshold for marine mammals and other marine life because every species has different hearing sensitivities and even different hearing mechanisms. Human-made sounds also vary in loudness, frequency composition and duration. The National Oceanic and Atmospheric Administration in the USA has developed some threshold guidelines for marine mammals.

They recommend 120 dB_{rms} of continuous noise as the threshold for eliciting behavioral disruption for continuous noise (e.g., vibratory pile driving, drilling).

However, this threshold is based on bowhead whales responding to drilling noise in the Arctic Ocean. This species has specific hearing abilities, and the Arctic marine environment is different to Hauraki Gulf acoustically, and drilling is not the same noise as vessel noise.

So some caution in applying this US acoustic threshold value to the Hauraki Gulf situation would be warranted should the DMC decide to put a condition on underwater noise output on the tug-barge combination.

Alternatively, the spoil could be dumped to land and avoid all risks of acoustic and other impacts to marine life of the Hauraki Gulf.

References

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