Boffa Miskell

Memorandum

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Attention:	Garrett Hall
Company:	Beca
Date:	1st November 2019
From:	Dr Jacqui Bell and Dr Sharon De Luca
Message Ref:	Assessment of Effects of Existing Treated Wastewater on Māui Dolphin in Raglan Harbour
Project No:	BM19374

Introduction

Beca have engaged Boffa Miskell Ltd (BML) to assess the effects of the current wastewater treatment discharges in Raglan Harbour on Māui dolphin as part of Waikato District Council's (WDC) application to continue to discharge under the existing resource consent.

This memo outlines the ecological value and conservation status of Māui dolphin, the magnitude of potential effects of the current discharges of treated wastewater to Raglan harbour and the significance of these potential effects on Māui dolphin.

Methodology

Desktop Investigation

A desktop investigation was undertaken to obtain information and data on the existing ecological values of Māui dolphin and Māui dolphin habitat within areas affected by the existing wastewater discharge. The following sources were searched:

- Published literature;
- Unpublished reports;
- Statements of evidence;
- Relevant statutory documents;

Assessment of Ecological Value

We have assigned ecological values to Māui dolphin (Table 1). With regard to individual species such as Māui dolphin, all New Zealand biota have been assessed by DOC against a standard set of criteria (described in (Townsend et al., 2008) and lists published for each taxonomic group.[1] These criteria provide a consistent basis on which to assign ecological value for individual species such as Māui dolphin (see Table 1).

[1] Classifications as listed in Baker *et al.*(2016) for marine mammals.

Table 1: Criteria for assigning ecological value to species (based on Table 10 in EIANZ (2019))

ECOLOGICAL VALUE	SPECIES
Very High	Nationally Threatened *(Nationally Critical, Nationally Endangered, Nationally Vulnerable)*
High	Nationally At Risk – *Declining*
Moderate - High	Nationally At Risk – *Recovering, Relict, Naturally Uncommon*
Moderate	Locally uncommon/rare, not nationally threatened or at risk
Low	Not threatened nationally, common locally

Assessment of Ecological Effects

Magnitude of Ecological Effects

We assess the magnitude of ecological effects using the following criteria (Table 2):

Table 2: Criteria for describing magnitude of effect (Roper-Lindsay et al., 2018)

MAGNITUDE	DESCRIPTION
Very High	Total loss or very major alteration to key elements/features of the baseline conditions such that the post development character/composition/attributes will be fundamentally changed and may be lost from the site altogether; AND/OR Loss of a very high proportion of the known population or range of the element/feature.
High	Major loss or major alteration to key elements/features of the baseline (pre-development) conditions such that post development character/composition/attributes will be fundamentally changed; AND/OR Loss of a high proportion of the known population or range of the element/feature.
Moderate	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed; AND/OR Loss of a moderate proportion of the known population or range of the element/feature.
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns; AND/OR Having a minor effect on the known population or range of the element/feature.
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the “no change” situation; AND/OR Having negligible effect on the known population or range of the element/feature.

Assessment of Ecological Effects

We then assessed the level of ecological effects, based on ecological value (determined in Table 1) and effect magnitude (Table 2) using Table 3 as a guide.

The Environment Institute of Australia and New Zealand (EIANZ) (Roper-Lindsay et al, 2018) impact assessment guidelines state that the purpose of the document is to provide guidance on good practice in environmental management without being prescriptive.

Table 3: Matrix combining magnitude and value for determining the level of ecological impacts (Roper-Lindsay et al, 2018).

EFFECT LEVEL		Ecological and/or Conservation Value				
		Very High	**High**	**Medium**	**Low**	**Negligible**
Magnitude	**Very High**	Very High	Very High	High	Moderate	Low
	High	Very High	Very High	Moderate	Low	Very Low
	Moderate	High	High	Moderate	Low	Very Low
	Low	Moderate	Low	Low	Very Low	Very Low
	Negligible	Low	Very Low	Very Low	Very Low	Very Low
	Positive	Net gain	Net gain	Net gain	Net gain	Net gain

Māui Dolphin Distribution, Ecology and Conservation

Much of the west coast of the north island (between Maunganui Bluff and Oakura Beach extending 12 nautical miles offshore and including Raglan Harbour) is classified as a marine mammal sanctuary[2]

Raglan Harbour is recognised as an area which is used by the Māui dolphin (*Cephalorhynchus hectori Māui)*[3]. This species has a small distribution, on the west coast of the North Island, between Dargaville and New Plymouth, and is mostly seen within one nautical mile of the coast during the summer months (between October and March). Māui dolphins have a small range and tend to travel distances less than 35km (Currey et al., 2012).

The Māui dolphin is a small coastal dolphin. It is an opportunistic feeder that feeds in both the benthic and pelagic environment (Currey et al., 2012). It has a diet consisting of mainly fish (Curry et al., 2012). Māui dolphins are typically sighted in small groups (Curry et al., 2012). Māui dolphins have a short lifespan of less than 22 years. Females mature relatively late (at around 8-9 years of age) and give birth to a single calf every 2-4 years. The low reproductive rate makes this species particularly vulnerable to human induced population decline (Currey et al, 2012).

Māui dolphin is the rarest dolphin in the world, with an estimated population of between 48 and 69 individuals, with just 63 individuals over one year of age (Department of Conservation New Zealand Fisheries, 2019). It is ranked as *Threatened, Nationally Critical* in New Zealand's Threat Classification System (Baker et al., 2016). Population trends are uncertain due to the rarity of dolphin observations, but the species remains vulnerable to human induced deaths including fisheries bycatch and deaths due to the parasitic disease toxoplasmosis (Department of Conservation Fisheries New Zealand, 2019). There is uncertainty in the estimated number of Māui dolphin deaths due to toxoplasmosis, however currently, this disease is estimated to be the largest contributor to Māui dolphin deaths (Department of Conservation New Zealand Fisheries, 2019).

Assessment of Ecological Effects of Existing Discharge of Treated Wastewater in Raglan Harbour

Ecological Value

The Māui dolphin is ranked *Threatened, Nationally Critical*, we have therefore assigned this marine species an ecological value of Very High (Table 1).

Ecological Effects

Māui dolphin are exposed to a range of potential direct and indirect effects associated with the discharge of treated wastewater in to Raglan Harbour. Potential effects associated with the treated wastewater discharge include discharge of suspended sediment, temporary habitat disturbance, parasites or pathogens (including toxoplasmosis).

[2] https://www.doc.govt.nz/nature/native-animals/marine-mammals/dolphins/maui-dolphin/current-protection-measures/

[3] https://www.doc.govt.nz/our-work/our-work-with-maui-dolphin/maui-dolphin-sightings/

Suspended Sediments

Discharge plumes and suspended sediments have the potential to displace marine organisms and disturb the seafloor through reducing light availability and deposition to the seafloor. This could potentially indirectly affect Māui dolphins by reducing food availability in areas affected by sediment plumes, causing poor nutrition. Māui dolphins may as a result change their movement patterns during times of significant sediment discharge and deposition, to forage in areas where food is more abundant.

The current wastewater treatment system is producing peaks of total suspended sediment (TSS) associated with algal growth at an average annual concentration of 33mg/L and an average annual 90th percentile concentration of 84 mg/L (Beca, 2019). Discharges are temporary (median duration of discharge being approximately 2 hours and 15 minutes) and occur on average 15 minutes after high tide, with an average flow rate of 0.058 m^3/s (Beca, 2019; DHI, 2019). DHI (2019) modelled the dilution of the current wastewater discharges and found that reasonable mixing occurred at 150m of the point of discharge. Dilution at 150m was predicted to be 70-fold, whereas nearshore dilution, within 10m of the discharge point was predicted to be 12-fold. Given the temporary nature of discharges and the level of dilution during and after times of discharges the concentration of suspended sediments is likely to disperse sufficiently and is unlikely to cause a significant effect on the benthic or pelagic habitat, and therefore availability of food for Māui dolphins.

The potential magnitude of effect of suspended sediments on Māui dolphin has therefore been assessed as **Negligible**.

Toxoplasmosis

Toxoplasmosis is an infection caused by the *Toxoplasma gondii* parasite. It is spread by cat faeces and transported in to the marine environment mainly through land runoff (Department of Conservation Department of Fisheries, 2019). Toxoplasmosis can affect Māui dolphins both directly and indirectly. It is a confirmed cause of death in Māui dolphins and is likely to be a significant threat to the dolphins' populations by potentially lowering the immune capabilities of this species (Department of Conservation Department of Fisheries, 2019).

Wastewater treatment plants may also be a source of the Toxoplasma spp parasite, (if cat faeces/kitty litter have been flushed down the toilet, which is an unlikely event) as the oocysts[4] cannot be treated by standard wastewater disinfection methods such as UV radiation[5].

Treated wastewater is unlikely to contribute significantly to the concentrations of this parasite within the harbour, compared to land-based runoff, on which cat faeces are more likely to originate. This, along with the level of dilution, relatively small area of reasonable mixing (DHI, 2019), and the temporary nature of the discharges, the potential magnitude of effect of Toxoplasmosis on Māui dolphin, resulting from treated wastewater discharges has therefore been assessed as **Negligible.**

Level of Effects

The level of potential adverse effects of the current treated wastewater discharges on Māui dolphin is Low for discharges of suspended sediment and Low for toxoplasmosis (Table 6).

Table 4: Summary of ecological values, magnitude of effect and significance of effect

	ECOLOGICAL VALUE	MAGNITUDE OF EFFECT	LEVEL OF EFFECT
Discharges of suspended sediment	Very High	Negligible	Low
Toxoplasmosis	Very High	Negligible	Low

[4] a cyst containing a zygote formed by a parasitic protozoan

[5] https://www.doc.govt.nz/nature/pests-and-threats/diseases/toxoplasmosis-and-hectors-and-Māui -dolphin/

Conclusion and Recommendations

The concentration of suspended sediments should continue to be monitored and minimised throughout the consent period, in order to continue to ensure an ongoing low level of effect on Māui dolphins.

Given the sensitivity of Māui dolphin to toxoplasmosis, it is recommended that the concentration of the parasite *Toxoplasma gondii* is included as a parameter to be measured in wastewater quality monitoring going forward, in order to better assess the risk of adverse effects of toxoplasmosis from treated wastewater on the Māui dolphin.

References

Baker, C. S., Chilvers, B. L., Childerhouse, S., Constantine, R., Currey, R., Mattlin, R., Rolfe, J. (2016a). *Conservation status of New Zealand marine mammals, 2013* (New Zealand Threat Classification Series No. 14). Wellington: Department of Conservation.

Beca (2019) Raglan Wastewater Treatment Plant – Water Quality. Prepared for Waikato District Council.

Currey, R.J.C.; Boren, L.J.; Sharp, B.R.; Peterson, D. 2012: A risk assessment of threats to Māui ’s dolphins. Ministry for Primary Industries and Department of Conservation, Wellington. 51 p.

DHI (2019) Raglan Wastewater Treatment Plant Discharge Assessment. Prepared for Beca.

Department of Conservation Fisheries New Zealand (2019) Protecting Hectors and Māui Dolphins. Consultation on proposals for an updated Threat Management Plan.

Roper-Lindsay, J., Fuller, S. A., Hooson, S., Sanders, M. D., & Ussher, G. T. (2018). *Ecological impact assessment (EcIA). EIANZ guidelines for use in New Zealand: Terrestrial and freshwater ecosystems* (2nd ed.). Melbourne: EIANZ.

Townsend, A. J., de Lange, P. J., Duffy, C. A., Miskelly, C. M., Molloy, J., & Norton, D. A. (2008). New Zealand threat classification system manual. *Department of Conservation, Wellington*, *16*, 2008-11.