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4 April 2017
Attn: Michael Gunson
Surfbreak Protection Society

Dear Michael,

Re: Review of MetOcean Report: Existing and post sediment disposal nearshore wave dynamics and potential effects on inshore surfing conditions.

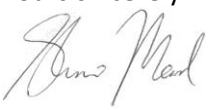
The MetOcean surfing impact report is fundamentally flawed and provides little useful information to determine the impacts of the actual proposed activity. Given the close proximity to the coast, there are concerns both due to the direct effects and cumulative impacts on Christchurch's main surf breaks. It is well known that the seabed morphology offshore of breaks 'pre-conditions' waves through the process of refraction/diffraction, and that offshore mounds can have a profound impact on surfing breaks (Battalio, 1994; Mesa, 1996; Mead et al., 2003; Pitt, 2010; Mead et al., 2012). The flaws in the approach undertaken include:

1. Unrealistic disposal of material. It is impossible to dispose of material completely evenly over the capital and maintenance dredge sites to result in rectangles on the seabed with elevations of 1.44 m and 0.35 m respectively. As a result, the modelling displays artificial results of focussing and defocussing off the abrupt sides and corners of these unrealistic seabed formations. Scenario modelling of possible mounds should have been undertaken to consider the impacts that different morphologies have on the wave, including worst-case scenarios to direct the disposal.
2. These disposal ground patterns/shapes are considered 'conservative'. However, they are not conservative due to:
    a. unrealistically reducing the height of the mounds by creating flat seabed features with vertical sides;
    b. not considering the impacts of both the maintenance and capital dredge disposal grounds together (they will not be there separately, and have the potential to create *cumulative impacts* such as occur at Aramoana with the offshore ebb-tidal delta and the nearshore disposal site interactions (Atkin and Mead, 2012)), and
    c. not considering the cumulative impacts of year upon year of maintenance disposal; only a single year of maintenance dredging is considered, which with volumes of 900,000 m^3 per year is a very large volume of material, and;
    d. simply stating that it is a 'worst' case scenario because bathymetric changes in that no sediment transport of the disposed material is considered, is not in fact 'worse' case Given that the disposal site are relatively deep (16-17 m for the maintenance, and 18-20 m for the capital) resulting in low rates of sediment transport, and because the cumulative impacts of annual dredging are not considered.

3. Considering the inadequate modelling undertaken here, the model results show that there will be changes to the nearshore wave climate. Even small changes to the drivers of sediment transport can result in changes to or new morphological features which have previously been shown to evolve in to large scale morphological features (Ashton et al 2001; Ashton and Murray 2006; Coco and Murray, 2007). The small perturbations lead to modification of the flow, this positively feeds back in modification to the morphological setting, which again modifies the driving forces. In the analysis of the changes to wave climate, wave heights are considered at the 6 m contour – this is a significant distance from what would be surfing areas in the relatively flat coastal zone; therefore the changes in wave height may even be more considerable closer to shore when further refraction/diffraction process have taken place. In addition, the results do not allow for a simple evaluation to changes in wave direction (both offshore and in the nearshore).
4. Only periods above 11 seconds have been considered, which is rationalised with a statement that lower period waves will not be impacted by the mounds because they will not refract/diffract as much. While it is correct that longer period waves 'feel the bottom' at greater water depths than short period waves, and that waves begin to feel the bottom at between ¼ and ½ of their wavelength, in the present context that is not applicable. The Christchurch coast's wave climate is dominated by waves between 7 and 10 seconds, with a mean period of 6.74 seconds (Walsh, 2001; Mead et al., 2002), with wave periods at the lower end (i.e. 7 seconds) having a wave length of 72 m in 20 m of water; i.e. they will be effected by the proposed offshore mounds. The impact report's statement that impacts on short period waves will be negligible is unsupportable.
5. The conditions chosen to characterise the surfing conditions are not suitable. While Significant swell wave height larger than 1.0 metre can be argued as appropriate, wave period is discussed above, and the duration of events (6 hours) can be seen as a limiting factor, limitation due to wind speed and direction is inappropriate. Surfable wind conditions are very subjective. Learner surfers do not have the requirement's for "clean" surfing conditions that intermediate and advanced surfers favour (i.e. less than 10 knots). Advanced surfers also actively seek a variety of wind conditions (e.g. onshore/offshore/cross shore) to practice advanced manoeuvres (e.g. aerials).
6. The method for determining surfing conditions is unclear. This leads to the interpretation that their method omits a considerable amount of southerly conditions. The concern is that, according to the Wavetrack New Zealand Surfing Guide, the surf breaks of both South Shore and Sumner Bar are favourable during southerly swells. Indeed, there is little to no characterisation of the local surf breaks, which would generally require local consultation with stakeholders from the surfing community.
7. Seasonality is not considered. The Christchurch coast is very seasonal in terms of surfing conditions, with longer period waves from the southern quarter being more common in the winter and shorter period easterly quarter waves being more common in the summer. This seasonality will obviously impact on surfing conditions and will likely differ between seasons.
8. Cumulative impacts have not been considered. There are 4 cumulative effects that have not been considered:
    a) Continual addition of material to the nearshore disposal ground.
    b) The combined impact of both the maintenance and capital mounds.
    c) The combined impacts of this proposal and the Pegasus Bay mussel farm.
    d) The combined impacts of dredging and disposal in terms of suspended sediment/water quality on top of water quality impacts from multiple other human activities.

9. Policy 16 of the NZCPS protections surf breaks at a national level, which is then considered at a regional level for regional Coastal Policy (e.g. Atkin et al., 2014), and includes avoiding adverse effects of other activities on access to, and use and enjoyment of the surf breaks. Water quality impacts on the use and enjoyment of surfing, but has not been considered in this assessment, and has been poorly assessed in the MetOcean reports pertinent to this impact. Given that 80% of the dredged material is fines and that the 900,000 m^3 annual maintenance dredging will likely include a significant fraction of fines, disposal of these materials only 4-5 km from regionally significant surfing breaks (Taylors Mistake and Sumner Beach, respectively) is cause for concern in terms of water quality.
10. Only a single monochromatic wave event ("statistically most relevant reference event" – height, period, direction not stated) was modelled to consider impacts on wave crests. While there is no discussion on how swell events effect surfing or surfing wave quality along Christchurch's coast (different directions and periods, seasonal events, mixed swell events, etc.), the modelling presented in Section 3.3. of the MetOcean report is similar to the SWAN modelling in that it provides little if any confidence on the conclusions drawn with respect to impacts. The output is not presented in a format where an evaluation of any changes to coastal processes can be made. The report states that "It is not however appropriate to make comparisons of the wave height modifications associated with monochromatic simulations due to the inherently streaky nature of the modelled results when only one frequency/directional component is considered". This is the simplest scenario to consider.
11. Contrary to the reports summary that this report provides baseline information on nearshore wave fields that could be used for an adaptive management approach for future disposal activities, it provides very little. The results are of an unrealistic and flawed assessment. In order to adaptively manage, you must first have some understanding of the potential impacts and the natural environment – the impact study does not provide anything of use in this area.

Yours sincerely



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