

**IN THE MATTER** of the Resource Management  
Act 1991

**AND**

**IN THE MATTER** Plan Change 1 – (Waikato and  
Waipa Catchments) to the  
Waikato Regional Plan.

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**STATEMENT OF REBUTTAL EVIDENCE OF DEAN CRAIG MILLER,  
ON BEHALF OF MERCURY NZ LIMITED (SUBMITTER NUMBER 73182)**

**HEARING BLOCK 1 – TOPIC B**

**26 FEBRUARY 2019**

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## 1. EXECUTIVE SUMMARY

- 1.1 My full name is Dean Craig Miller. I have the qualifications and experience as set out in paragraphs 2.1 to 2.5 of my primary statement of evidence.
- 1.2 I have been engaged by Mercury NZ Limited (**Mercury**) to provide technical evidence in relation to its submissions on Plan Change 1 (**PC1**) to the Waikato Regional Plan.
- 1.3 In this statement of rebuttal evidence, I:
- (a) respond to aspects of the primary statement of evidence of **Dr Martin Neale** on behalf of Wairakei Pastoral Ltd and specifically on matters relating to the management of nitrogen and phosphorous and the application of Lake attributes to the main stem of the Waikato River upstream of Tutukau Bridge.
  - (b) respond to aspects of the primary statement of evidence of **Ms Kathryn McArthur** on behalf of the Director-General of Conservation and specifically on matters relating to her recommendation for a Macroinvertebrate Community Index attribute and target values.
  - (c) make general comment on the primary statements of evidence of **Ms McArthur, Dr Adam Canning** (on behalf of Fish & Game) and **Dr Olivier Ausseil** (on behalf of Waikato and Waipa River Iwi) who have all recommended additional attributes and targets and/or alternative methods for target development.

### Primary Evidence of Dr Neale

- 1.4 Dr Neale has suggested that phosphorous could be managed in favour of nitrogen to address phytoplankton biomass in the main stem of the Waikato River. In my opinion, favouring the management of one nutrient over the other could occur on a sub-catchment or tributary catchment basis. If applied universally, however, there is a risk that PC1 objectives for chlorophyll a and clarity may not be achieved in the main stem of the Waikato River. I have provided reasoning for my views in the body of my evidence.
- 1.5 Dr Neale considers that the chlorophyll a attribute is not appropriate to apply to the main stem of the Waikato River upstream of Tutukau Bridge. Dr Neale's reasoning is that the reach of the Waikato River between Aratiatia Dam and

Tutukau Bridge is more riverine in nature and therefore a different management approach is appropriate. My opinion is that the reach in question is a lake fed river given it is downstream of Lake Aratiatia and Lake Taupo, the latter of which is subject to nutrient management specifically to manage chlorophyll *a* and water clarity. Chlorophyll *a* should therefore be included as an attribute at all Waikato River main stem sites in the Upper Waikato FMU, including any additional main stem sub-catchment sites proposed.

#### Primary Evidence of Ms McArthur

- 1.6** Ms McArthur has recommended a range of new attributes and associated short term and long term targets, including for the Macroinvertebrate Community Index (**MCI**). MCI targets are proposed for all sites including sites on the main stem of the Waikato River. The MCI was developed for wadeable streams with both hard and soft bottom substrate variants. Similarly, national macroinvertebrate sampling protocols have been developed for wadeable streams (Stark et al, 2001). My opinion is that the MCI is not appropriate as an attribute for non-wadeable river and stream sites, such as the main stem of the Waikato River.

#### Primary Evidence of Dr Ausseil, Ms McArthur and Dr Canning

- 1.7** A theme across the primary evidence of Dr Ausseil, Ms McArthur and Dr Canning is the suggestion of including additional attributes and additional or alternative target values based on available national guidance for the National Objectives Framework, various other national guidelines, experience with other regional plan changes and their own analysis.
- 1.8** While some arguments for the development of additional targets have some merit, and could potentially be relatively straight forward (such as the development of MCI targets for wadeable streams), others will be less appropriate on a site to site basis, are complex, and may require considerable further technical work before their development, and subsequent implementation, can be considered. An example of the latter is the Fish Index of Biological Integrity as recommended by Dr Canning.
- 1.9** While the additional attributes and targets identified, could be useful as a starting point for *future* development and amendments to PC1, in my view, a

significant volume of additional technical work is likely to be needed to robustly develop such targets, particularly in the absence of current state data.

## 2. INTRODUCTION

- 2.1 My full name is Dean Craig Miller.
- 2.2 I have the qualifications and experience as set out in paragraphs 2.1 to 2.5 of my primary statement of evidence.
- 2.3 As stated in my primary statement of evidence, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014 and that I agree to comply with it.
- 2.4 I have been engaged by Mercury NZ Limited (**Mercury**) to provide technical evidence in relation to its submissions on Plan Change 1 (**PC1**) to the Waikato Regional Plan.
- 2.5 In my primary statement of evidence, I have addressed technical matters relating to the implementation of PC1 to achieve Objective 3, to the location of the Upper Waikato Freshwater Management Unit (**FMU**) monitoring site, and to the scale of PC1 sub-catchment areas and sub-catchment monitoring sites.
- 2.6 In this statement of rebuttal evidence, I:
- (a) respond to aspects of the primary statement of evidence of Dr Martin Neale on behalf of Wairakei Pastoral Ltd and specifically on matters relating to the management of nitrogen and phosphorous and the application of Lake attributes to the main stem of the Waikato River upstream of Tutukau Bridge.
  - (b) respond to aspects of the primary statement of evidence of Ms Kathryn McArthur on behalf of the Director-General of Conservation and specifically on matters relating to her recommendation for a Macroinvertebrate Community Index attribute and target values.
  - (c) make general comment on the primary statements of evidence of Ms McArthur, Dr Adam Canning (on behalf of Fish & Game) and Dr Olivier Ausseil (on behalf of Waikato and Waipa River Iwi) who have all

recommended additional attributes and targets and/or alternative methods for target development.

### **3. MANAGEMENT OF NITROGEN AND PHOSPHORUS – PRIMARY EVIDENCE OF DR NEALE**

- 3.1** In his review of “Current State” Dr Neale reaches a view that “*efforts to manage algal biomass in the Waikato River should focus more on managing P to achieve the Vision and Strategy*” (paragraph 20). This is on the basis of the various work completed by the Technical Leaders Group that suggests that phosphorus is a key limiting factor for phytoplankton growth. Dr Neale also refers to the trend analysis undertaken by Vant (2018<sup>1</sup>), notwithstanding the uncertainty with the phosphorous data, that suggests phytoplankton growth in the river is less dependent on availability of nitrogen (as compared with phosphorous).
- 3.2** Dr Neale’s assessment of the “Management of Nitrogen” suggests that the emphasis on Nitrogen management in PC1 is “questionable” partly because of the relatively (lesser) importance of nitrogen compared with phosphorous with respect to phytoplankton biomass.
- 3.3** I agree that the available information suggests that phytoplankton growth and biomass is limited more by phosphorous availability. However, I don’t fully support Dr Neale’s assessment of the relative importance of nitrogen and phosphorus to manage Chlorophyll *a*. This is mainly on the basis that Dr Neale’s assessment is over simplified. I am concerned that acceptance of Dr Neale’s assessment could lead to a conclusion that, in general, phosphorous could be managed in favour of nitrogen.
- 3.4** I consider that the arguments for managing both nitrogen and phosphorus in the primary statement of evidence of Dr Depree on behalf of DairyNZ Limited (Paragraph 6.9) provide a more balanced view and I support Mr Depree’s assessment. In my opinion, both nitrogen and phosphorous need to be

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<sup>1</sup> Vant WN. 2018. Trends in river water quality in the Waikato region, 1993-2017. Waikato Regional Council Technical Report 2018/30

managed in order to manage phytoplankton growth and biomass (and subsequent impacts on water clarity).

- 3.5** Further to the above, I would highlight that nutrient and phytoplankton dynamics are complex and the degree to which nutrients limit phytoplankton growth and biomass in the main stem of the Waikato River in the Upper Waikato FMU varies both spatially and temporally. To illustrate this point, I have included two plots as **Appendix A** that show trends over time in the ratio of nitrogen to phosphorous for four sites on the upper Waikato River (WRC provided data). The plots include approximate thresholds for when nitrogen and phosphorous may be potentially limiting phytoplankton growth<sup>2</sup>.
- 3.6** The Appendix A plots show general agreement with the conclusion in Vant (2015<sup>3</sup>) of balanced nutrient conditions (nutrients are largely co-limiting). However, there is also significant fluctuation over time and a clear seasonal trend when considering the raw paired data. That is, that phytoplankton growth conditions are potentially more phosphorous limited in winter and early summer, and potentially more nitrogen limited in late summer. In my view, this lends further support to the importance of managing both nitrogen and phosphorous.
- 3.7** Favouring the management of one nutrient over the other may be appropriate on a sub-catchment or tributary catchment basis, if specific information were available to suggest that was appropriate. For example, the management of one nutrient over the other may be effective where sub-catchment scale planning identified that one nutrient was a specific issue or where there was a local downstream receiving environment water quality issue that would be most effectively managed by focussing on one nutrient. However, in my opinion there is a risk that PC1 objectives for chlorophyll a and clarity may not be achieved by universally focussing only on one nutrient.

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<sup>2</sup> Where the TN/TP ratio is less than about 10 (by weight), plant growth is likely to be limited by the supply of N; if the ratio is greater than about 17, growth is likely to be limited by the supply of P. If the ratio falls within the range 10–17, growth is regarded as being “balanced”, with the two nutrients being co-limiting.

<sup>3</sup> Vant, B. 2015b. Visual clarity of the Waikato and Waipa Rivers. Waikato Regional Council Technical Report 2015/13R

#### 4. THE APPLICATION OF LAKE ATTRIBUTES TO THE MAIN STEM OF THE WAIKATO RIVER – PRIMARY EVIDENCE OF DR NEALE

4.1 Dr Neale considers that the chlorophyll *a* attribute is not appropriate to apply to the main stem of the Waikato River upstream of Tutukau Bridge. Dr Neale's rationale is basically that this reach is more riverine in nature (as opposed to lacustrine – or lake-like), there are no current chlorophyll *a* or clarity issues and therefore a different management approach is appropriate.

4.2 My opinion is that the reach in question is a lake fed river given it is downstream of Lake Aratiatia and Lake Taupo, the latter of which is subject to nutrient management specifically to manage chlorophyll *a* and water clarity. Chlorophyll *a* should therefore be included as an attribute at all Waikato River main stem sites in the Upper Waikato FMU, including any additional main stem sub-catchment sites proposed.

#### 5. APPLICATION OF THE MCI AS AN ATTRIBUTE IN THE WAIKATO RIVER – PRIMARY EVIDENCE OF MS McARTHUR

5.1 Ms McArthur has recommended a range of new attributes and associated short term and long term targets, including for the Macroinvertebrate Community Index (**MCI**). MCI targets are proposed for all sites including sites on the main stem of the Waikato River.

5.2 The MCI as it was developed for wadeable streams with both hard bottom and soft bottom substrate variants. Similarly, national macroinvertebrate sampling protocols have been developed for wadeable streams.

5.3 A detailed review of the issues and options associated with the use of MCI as an attribute in the National Objectives Framework (**NOF**) was undertaken by the Macroinvertebrate Expert Group (**MEG**) and presented in a report to the Ministry of the Environment in late 2014<sup>4</sup>. A wide range of issues were examined by the MEG, including the application of the MCI to large, non-wadeable rivers. The discussion on the limitations in terms of applying the MCI to large non-wadeable rivers includes recognition of the following important limitations:

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<sup>4</sup> Collier KJ, Clapcott J, Neale M 2014. A macroinvertebrate attribute to assess ecosystem health for New Zealand waterways for the national objectives framework – Issues and options. Environmental Research Institute report 36, University of Waikato, Hamilton

- (a) large rivers are too deep to sample target habitats effectively;
- (b) sampling the margins only results in poor representation of non-wadeable parts of the river;
- (c) it is unclear how habitat limitations in shoreline areas might affect sensitivity scores for different taxa; and
- (d) there is a lack of accepted MCI quality classes for large rivers.

**5.4** The MEG's conclusion was that in the absence of the research required to address the above issues and the lack of standard non-wadeable river sampling protocols, the MCI attribute should only be applied to wadeable streams, which represent at least 90 % of New Zealand waterway length.

**5.5** My opinion is that it is not appropriate to apply the MCI to non-wadeable river and stream sites, such as the main stem of the Waikato River.

**6. ADDITIONAL ATTRIBUTES AND TARGETS – PRIMARY EVIDENCE OF DR AUSSEIL, MS McARTHUR AND DR CANNING**

**6.1** A theme across the primary evidence of Dr Ausseil, Ms McArthur and Dr Canning is the suggestion for including additional attributes and additional or alternative target values based on available national guidance for the NOF, various other national guidelines, experience with other regional plan changes and their own analysis.

**6.2** While some arguments have some merit and the development of additional targets could potentially be relatively straight forward (such as the development of MCI targets for wadeable streams), others will be less appropriate on a site to site basis, are complex, and may require considerable further technical work before their development, and subsequent implementation, can be considered. An example of the latter is the Fish Index of Biological Integrity (IBI) as recommended by Dr Canning. The fish IBI will be heavily influenced by migration barriers so efforts to improve water quality (and habitat quality) may not result in progress toward a target.

**6.3** The analysis of each alternate methodology or target value proposed is beyond the scope of rebuttal evidence. While the additional attributes, targets and values proposed by the various experts could be useful as a starting point for future amendments to PC1, in my view, a significant volume of additional

technical work is needed to robustly develop such targets, particularly in the absence of current state data. I agree with Dr Ausseil that there will be little gained from adding multiple attributes without clearly understanding the issue they seek to manage and the implications of setting additional targets (paragraph 50 of Dr Ausseil's primary evidence).

- 6.4** Notwithstanding the above, I support the commencement and/or ongoing monitoring of the various additional attributes sought by the above experts at stream, river and lake sites as appropriate, regardless of whether additional attributes or targets are developed for the purposes of PC1. I recognise (and support) that many of the recommended attributes are already monitored as part of existing Waikato Regional Council state of the environment programmes (e.g. macroinvertebrates and fish).

**Dean Craig Miller**

**26 February 2019**

## APPENDIX A - Nutrient Ratio Plots for upper Waikato River monitoring sites

