

**BEFORE THE PROPOSED NATURAL RESOURCES PLAN HEARINGS PANEL**

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

**AND**

**IN THE MATTER** of Water quality

**AND**

**IN THE MATTER** of Right of Reply evidence to matters  
raised during Hearing Stream 4

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**STATEMENT OF RIGHT OF REPLY EVIDENCE OF RICHARD GOODWIN STOREY ON  
BEHALF OF WELLINGTON REGIONAL COUNCIL**

**TECHNICAL- Nutrient management**

**4<sup>th</sup> May 2018**

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## **1. INTRODUCTION**

1.1 My name is Richard Goodwin Storey. I am a freshwater ecologist with 13 years' experience at the National Institute of Water and Atmospheric Research (NIWA). I have a Ph.D. in Zoology from University of Toronto and a M.Sc. in Zoology from University of Auckland. I am a member of the Society for Freshwater Science and the New Zealand Freshwater Sciences Society. My area of expertise is in the ecology of aquatic macroinvertebrates, the biological assessment and rehabilitation of streams, and ecological modelling to support freshwater decision-making. In regard to the latter, I have developed a decision-support model for the Ruamahanga catchment in Wellington Region, which involved extensive analysis of ecological and hydrological data from this catchment and consultation with scientists familiar with the catchment. A full copy of my qualifications and experience is available in **Attachment A** of my primary evidence.

1.2 I have been engaged by Great Wellington Regional Council to provide evidence relating to the Proposed Natural Resources Plan for Water Quality.

## **2. CODE OF CONDUCT**

2.1 I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note and that I agree to comply with the code. My evidence in this statement is within my area of expertise. I have not omitted to consider material facts known to me that might alter to detract from the opinions which I express.

## **3. SCOPE**

3.1 I have been asked to provide evidence in response to submissions received coded to topic Water Quality for the following specific matters/areas/schedules:

- (a) Assessment of the relationship between dissolved nutrients and MCI values in Wellington streams and rivers.
- (b) And setting region-wide nutrient limits as a means for raising MCI values to meet target values in Wellington streams and rivers.

### 3.2 The scope of my primary evidence included

- (a) assessing submissions relating to nutrient management as a means for achieving target MCI values in streams and rivers of the Wellington region, including the technical rigour of the methodologies in these submissions and the appropriateness of setting region-wide nutrient limits for achieving target MCI values.
- (b) Summary of alternative methods for deriving a relationship between nutrients and MCI, and for achieving target MCI values.

### 3.3 My Right of Reply Evidence elaborates on a few points made in the primary evidence and in the “Joint Conferencing Statement” between Dr. Russell Death, Ms. Kate McArthur and myself (27 Feb 2018). These points are:

- (a) How to manage multiple stressors to achieve MCI targets
- (b) How to set nutrient criteria appropriately for different stream and river types.

## **4. RESULTS**

### **4.1 Primary evidence still stands**

- (a) After conferencing with Prof. Death and Ms. McArthur, my primary evidence remains unchanged.
- (b) A key point in my primary evidence is that there are multiple drivers of MCI. All of these drivers (stressors) need to be managed to improve MCI. In each situation, management should focus on the critical stressor(s) that are primarily responsible for depressing MCI. Since the critical stressor(s) are likely to differ from one stream or river to the next, improving MCI will likely require management to focus on different stressors in different streams or rivers.
- (c) A second key point is that in almost all situations in which nitrogen and phosphorus are below levels toxic to invertebrates (which will be the vast majority of streams in the Wellington region), the relationship between nutrients and MCI is mediated by periphyton. In other words, the way that

nutrients affect MCI is by promoting excess periphyton growth which then affects macroinvertebrates (by altering their food supply and physical habitat).

#### **4.2 Elaborating on points of agreement in the Joint Conferencing Statement**

- (a) Bullet points 2, 6, 7 and 8 in “points of agreement” of the Joint Conferencing Statement state acknowledge that other stressors (as well as nutrients) affect MCI and that improving MCI requires management of all stressors. I would conclude from these statements that there are some streams and rivers where reducing nutrient concentrations will not lead to an improvement in MCI. This is not stated explicitly, thus I am not sure whether this point is agreed by the three parties to the joint statement, but to me it is a logical extension of the agreed points.

#### **4.3 Elaborating on unresolved matters in the Joint Conferencing Statement**

- (a) I did not agree with Prof. Death’s and Ms. McArthur’s statement that the same relationship between nutrient concentrations and MCI levels can be used to set nutrient limits for all river types.
- (b) We did agree that where nutrient concentrations are below toxic levels (i.e. in almost all Wellington streams and rivers), the relationship between nutrients and MCI is driven primarily by periphyton. Therefore, in my opinion, relevant criteria for nutrient concentrations are those that maintain low periphyton growth.
- (c) The 2017 amendments to the National Policy Statement for Freshwater Management specify nutrient management to maintain low periphyton growth, specifically (from Appendix 2 of the NPS-FM (2017)):

**“Note:** *To achieve a freshwater objective for periphyton within a freshwater management unit, regional councils must at least set appropriate instream concentrations and exceedance criteria for dissolved inorganic nitrogen (DIN) and dissolved reactive phosphorus (DRP). Where there are nutrient sensitive downstream receiving environments, criteria for nitrogen and phosphorus will*

*also need to be set to achieve the outcomes sought for those environments.*

*Regional councils must use the following process, in the following order, to determine instream nitrogen and phosphorus criteria in a freshwater management unit:*

- a) *either –*
  - i. *if the freshwater management unit supports, or could support, conspicuous periphyton, derive instream concentrations and exceedance criteria for DIN and DRP to achieve a periphyton objective for the freshwater management unit; or*
  - ii. *if the freshwater management unit does not support, and could not support, conspicuous periphyton, consider the nitrogen and phosphorus criteria (instream concentrations or instream loads) needed to achieve any other freshwater objectives:*
- b) *if there are nutrient sensitive downstream environments, for example, a lake and/or estuary, derive relevant nitrogen and phosphorus criteria (instream concentrations or instream loads) needed to achieve the outcomes sought for those sensitive downstream environments:*
- c) *compare all nitrogen and phosphorus criteria derived in steps (a) – (b) and adopt those necessary to achieve the freshwater objectives for the freshwater management unit and outcomes sought for the nutrient sensitive downstream environments.”*
- (d) Therefore, the NPS-FM 2017 recognises that some freshwater management units (i.e. streams and rivers) support conspicuous periphyton growths whereas others do not. It states that setting appropriate DIN and DRP criteria should recognise these differences, as well as whether there are sensitive downstream receiving environments.
- (e) Further, Ministry for the Environment recognises that setting nutrient criteria to control periphyton growth is technically complicated. In a request for quotes entitled “Technical Guidance for the Freshwater NPS periphyton attribute table note. 0927-01-RFQ”, MfE states that “the note [in the NPS-FM 2017] instructs councils to undertake a technically complicated process to derive the appropriate nutrient criteria. There are significant uncertainties and difficulties in defining concentrations, loads and exceedance criteria., therefore technical guidance is required to explain the details and methods behind these steps.”

- (f) Even experts in the field have different opinions on the best method for setting nutrient concentrations to control periphyton growth (Fleur Matheson, NIWA, pers. comm.). Indeed, the aim of the current work commissioned by MfE (under the RfQ quoted above) is to reach agreement among experts on the best method for managing periphyton biomass via nutrient criteria.
- (g) Table 3.4 of the pNRP includes targets for periphyton. Since the NPS-FM requires councils to set nutrient criteria to achieve periphyton objectives, it would appear that nutrient criteria will be set under the whitua process. Setting criteria through this process allows for criteria to be targeted appropriately for different stream and river types.

## **5. CONCLUSION**

- 5.1 My evidence provides recommendations regarding submissions made on the setting of nutrient limits to achieve target MCI levels under Proposed Natural Resources Plan topic Water Quality.
- 5.2 Because in most situations the relationship between nutrients and MCI is mediated by periphyton, and because streams and rivers differ in their ability to support conspicuous periphyton growths (as recognized in the NPS-FM), in my opinion it is not wise to apply a single correlation between nutrients and MCI to all stream types.
- 5.3 Because setting nutrient limits to manage periphyton growth is complex and recommended methods are currently being agreed on, in my opinion it is premature to set nutrient limits using a simple methodology such as a correlation between nutrients and MCI.

## **6. RECOMMENDATIONS**

- 6.1 Rather than setting nutrient criteria for all streams and rivers in the Wellington region by applying a single correlation between nutrient concentrations and MCI, a more appropriate method would be:
  - (a) in each stream/river (or stream/river type) identify the primary stressors responsible for depressed MCI values and focus management on alleviating those stressors.
  - (b) in streams and rivers that support conspicuous periphyton growth, use the periphyton targets in Table 3.4 to achieve

target MCI values. Nutrient criteria to achieve target periphyton values should follow the process outlined in the NPS-FM and the methodology being developed in current MfE-commissioned work.