

**BEFORE THE ENVIRONMENT COURT  
I MUA I TE KOOTI TAI AO O AOTEAROA**

<b>UNDER</b>	The Resource Management Act 1991 (RMA)
<b>IN THE MATTER</b>	Appeals under clause 14(1) of the First Schedule of the Act in relation to the Proposed Southland Water and Land Plan
<b>BETWEEN</b>	<b>MERIDIAN ENERGY LIMITED</b> <b>Appellants</b>
<b>AND</b>	<b>SOUTHLAND REGIONAL COUNCIL</b> <b>Respondent</b>

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**WILL SAY STATEMENT**

**MARK RICHARD JAMES**

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(ENV-2018-CHC-46)

**TE RUNANGA O NGAI TAHU, HOKONUI RUNAKA, WAIHOPAI RUNAKA, TE  
RUNANGA O AWARUA AND TE RUNANGA O ORAKA APARIMA**  
(ENV-2018-CHC-47)

**PETER CHARTRES**  
(ENV-2018-CHC-48)

**RAYONIER NEW ZEALAND LTD**  
(ENV-2018-CHC-49)

**ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NZ INC**  
(ENV-2018-CHC-50)

**Appellants**

**AND**

**SOUTHLAND REGIONAL COUNCIL**

**Respondent**

## **INTRODUCTION**

1. My full name is Mark Richard James.
2. I am an aquatic ecologist holding the following degrees, BSc Victoria University, Wellington; BSc (Hons) Victoria University, Wellington and PhD (Aquatic Biology), University of Otago, Dunedin.
3. I have a background in basic and applied research in marine and freshwater ecology and biology with over 42 years' experience in research, consulting and management of science organisations.
4. I confirm I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2014 and agree to comply with them in giving evidence in this proceeding. Except where I state that I am relying on the evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this statement.
5. This Will Say Statement will summarise and outline my evidence including:
  - i. Describing the existing state and recent trends for water quality, periphyton and macroinvertebrates in the Waiau River;
  - ii. Comparing water quality with limits for ecosystem health, standards and attributes of ecosystem health; and
  - iii. Assessing whether degradation is due to the operation of the Manapouri Power Scheme (MPS) and if so can it be addressed.
6. I also note that Meridian has commissioned NIWA to collate and analyse water quality, periphyton and macroinvertebrate data for the last 3 years for sites monitored in the Waiau River and wider catchment. This information will be available prior to the hearing and will be incorporated into my final evidence.
7. My focus is on monitoring sites in the Waiau River as these are the sites potentially impacted by the MPS rather than the sub-catchments and tributaries.
8. The purpose of this statement is to assist with the Expert Witness Conferencing. It is intended to identify issues and to assist in recording areas where the respective experts may agree and/or disagree, including reasoning, at the conferencing scheduled in November or December 2021. Based on information to hand my evidence will say the following.

## **EVIDENCE**

### Limits and standards

9. There are a number of guidelines, standards, attributes and limits that have been developed and applied to water quality. For the purposes of this hearing, I will refer to the attribute states for ecosystem health from the National Policy Statement for Freshwater Management 2020 (NPS-FM 2020, MFE 2020), receiving water standards in Appendix E of the Proposed Southland Water & Land Plan (pSWLP), and outcomes of the Joint Witness Statement of Ecologists from the Topic A hearing (JWS 2019).

### Ecosystem health and degradation in the Waiau Catchment

#### *NPSFM 2020*

10. Ecosystem health is a compulsory value in the NPS-FM 2020. Water quality, aquatic life and ecological processes are three of the five biophysical components that contribute to ecosystem health. Attributes that require limits on resource use in rivers include periphyton, ammonia toxicity, nitrate toxicity, dissolved oxygen (DO), suspended fine sediment, *E.coli*, and cyanobacteria. Attributes requiring action plans for rivers include macroinvertebrate community index (MCI) and quantitative macroinvertebrate community index (QMCI), deposited fine sediment, DO, DRP and *E.coli*.
11. Median attributes that are below the national bottom lines in the lower Waiau River are visual clarity, MCI and QMCI

#### *Expert conferencing thresholds*

12. The JWS 2019 concluded that Appendix E was not fit for purpose for defining degradation and would need to be rewritten at some point. I understand this will be either as part of the FMU process or a change to the pSWLP at the time of notification of the FMU Plan process.
13. Based on the thresholds for degradation from the JWS 2019 the attributes that defined sites on the Waiau River as degraded were periphyton biomass (Waiau at Tuatapere), deposited sediment (site below Mararoa Lake Control (MLC)), MCI at all 3 sites assessed, and *E.coli* (Waiau at Tuatapere sites).
14. No sites exceeded the enrichment thresholds set in the JWS 2019 for dissolved inorganic nitrogen or DRP. However, I note that these were conservative thresholds set for Southland-wide assessment.

15. Preliminary analyses of recent data and trends over time have shown that over the last 5, 10 and 25 years there has generally been an improving trend in DRP concentrations, possible deteriorating trend in *E.coli* in the lower Waiau River, and certain deteriorating trends in nitrate-N.

*Appendix E in pSWLP*

16. The overall aspiration to improve the water quality of our rivers is critical for maintaining and improving ecosystem health. Policy 15A and 15B are critical to achieving good ecosystem health in the Waiau River. However, there are a number of problems with the current Appendix E in terms of the standards set for some water bodies and the way these are being applied to different water bodies.
17. The Waiau River is classified for the purposes of Appendix E as “Lake fed” for its entire length, and the attribute standards for a “Lake fed” river therefore apply throughout its length. The attribute standards that are not met are occasional maximum temperature, visual clarity, periphyton chlorophyll a, MCI and QMCI, and *E.coli*.
18. The key issue with *E.coli* is the input from surrounding land-use changes around the Waiau River rather than any effect of the MPS. The operation of the MPS adds no *E.coli* to the system.
19. A reduction in the amount of clean water from Lake Manapouri could in theory exacerbate water clarity issues, but the clarity standard is not exceeded immediately downstream of MLC where the influence of the MPS on flows is greatest, and is only exceeded in the lower part of the river. From this I conclude it is the instream processes and tributary inputs downstream of the MLC, that in my view would likely be the cause of significant and adverse water clarity.
20. Similarly, while low flows could increase the risk of higher temperatures, New Zealand is experiencing warmer summers and other non-regulated rivers are experiencing similar exceedances.
21. The main issues for the Waiau River in Appendix E are the classification of the entire river as “Lake fed” and the special characteristics of a lake-fed system now dominated by didymo. The classification of water bodies is based on the River Environment Classification (REC) system. I gather from Dr Ton Snelder that this classification is based on where the water predominantly originates. Prior to the MPS the majority of the flow in the lower Waiau River would have originated from Lake Manapouri. However, for the last 50 years this is not the case, and cannot realistically be the case in the future, assuming the ongoing use of water for electricity generation by the MPS. Thus, in my view the classification needs to be revisited.

22. Hydrological data shows that the flow at Tuatapere is now on average made up of 52% from tributary inflows below the MLC and 26% from the Mararoa River. Thus, the average contribution from Lake Manapouri is only 22%. On this basis the upper part of the Waiau River (i.e above the main tributary inflows) should continue to be classified as Lake Fed and the lower part, including the sentinel site at Tuatapere, should be classified as Lowland Hard Bed. On this basis the standards that are exceeded in the lower part of the river would be MCI, QMCI, periphyton and at times *E.coli*. (Note the latest data and trends are yet to be analysed).

*Is the degradation due to operations of the Manapouri Power Scheme?*

23. The main ecosystem health attributes of concern and which indicate a degraded water body for the Waiau River are periphyton biomass, macroinvertebrate communities and microbial contamination.
24. The MPS does not contribute to the *E.coli* exceedances .
25. Lake fed rivers are characterised by more stable flows than other rivers and this, combined with low nutrient levels associated with the high-quality water of Lake Manapouri, provides an ideal environment for the proliferation of the invasive didymo.
26. Didymo was first reported in New Zealand in 2004 in the Waiau Catchment. Didymo is a special periphyton case (MFE 2018) as unlike other periphyton species it can proliferate, reaching very high biomass in nutrient poor, cold waters – waters that we would normally say are high quality. It can be especially prolific in stable lake-fed rivers. Excessive didymo growth can in turn impact on macroinvertebrates (snails, insect larvae, worms) and fish communities, and change community composition from high value species (insect larvae) to pollution tolerant species (eg oligochaete worms and snails).
27. Even without the MPS operating maximum periphyton chl-a is likely to have exceeded 50 mg/m<sup>2</sup>, and potentially 120 mg/m<sup>2</sup> at times, because of the low nutrient, lake-fed environment. However, lower base flows, lower flow variability and fewer high flow events will exacerbate the risk of exceedance for periphyton chl-a. Excessive periphyton growths are also observed in the unregulated Mararoa River which feeds into the lower Waiau River.
28. The only viable option to control didymo and improve the macroinvertebrate communities is to use supplementary flushing flows. At present Meridian operates a monitoring and management programme to help control excessive periphyton biomass when water is available. Up to four supplementary flushing flows have been released

each year. A significant increase in such flushing flows would be required to meet the pSWLP standards. A high number of flushing flows may help reduce exceedances for periphyton however regular flushing flows could have a detrimental effect on macroinvertebrate populations if they were continuously being reset.

29. In conclusion:

- The main attributes that result in the Waiau River being classified as degraded are periphyton biomass, relatively poor macroinvertebrate communities and microbial contamination.
- Microbial contamination is not due to the MPS operations.
- Periphyton biomass exceeds the pSWLP standards at times due to natural features of lake fed rivers and the introduction of didymo. This, in turn, results in lower value macroinvertebrate communities. The exceedances are exacerbated by lower flows, lower variability and fewer flushes due to the MPS operations. However, even without the MPS the river would be likely to experience exceedances of the standards.
- The Waiau River is classified as Lake fed throughout the catchment even though for the last 50 years most the water is from tributaries and upper rivers. The river should be reclassified as Lake fed in the upper part of the river and Lowland hard bed in the lower part of the river below the tributaries. The water quality in the Waiau River is degraded for some ecosystem health parameters and needs to be improved. Even with the reclassification to Lowland hardbed in the lower part of the river, the pSWLP's periphyton biomass standards may at times be exceeded at Tuatapere. (To be updated and confirmed for evidence)
- The special characteristics of the Waiau River system should be taken into account when Appendix E is revised.



**Mark Richard James**

**Dated:** 8<sup>th</sup> November 2021



**References:**

JWS (2019). Expert Conferencing – Water quality and ecology (Rivers and lakes). Proposed Southland Water and Land Plan – Southland Regional Council. September 2019.

MFE (2018). A draft technical guide to the periphyton attribute note – Under the National Policy Statement for Freshwater Management 2014 (as amended 2017). NIWA report prepared for MFE.

MFE (2020). National Policy Statement for Freshwater Management (NPS-FM) 2020. August 2020.