

BEFORE INDEPENDENT HEARING COMMISSIONERS

IN THE MATTER

of the Resource Management Act 1991

AND

IN THE MATTER

Proposed Waikato Regional Plan Change
1: Waikato and Waipa River Catchment

**STATEMENT OF REBUTTAL EVIDENCE OF DR BRUCE SYDNEY
THORROLD
FOR DAIRYNZ LIMITED
SUBMITTER 74050**

16 MAY 2019



Cnr Ruakura Road
& SH 26 Newstead
Hamilton 3286

Qualifications and experience

1. My full name is Bruce Sydney Thorrold. I am employed at DairyNZ as Strategy and Investment Leader, responsible for investment into and oversight of research projects relating to farm systems and nutrient management. I have the qualifications and experience set out in my primary evidence to Block 2. In my rebuttal evidence below, I draw on my previous role for AgResearch, where I was the Project Leader of the Catchment Management Team at Whatawhata Hill Country Research Centre from 1996 to 2001.

Code of Conduct

2. I have read the Environment Court's Code of Conduct for Expert Witnesses contained in Practice Note 2014 and agree to comply with it.

Scope of Evidence

3. My rebuttal evidence is provided in response to the Evidence in Chief filed by **Ms Corinna Jordan** on behalf of Beef and Lamb New Zealand Limited (BLNZ) on 6 May 2019. That evidence appears to concentrate on nitrogen (**N**) to the exclusion of the other three contaminants: sediment, phosphorus and E. coli, and requests drystock farmers have flexibility to increase nitrogen leaching (paragraphs 62 and 66).
4. Overall, in my professional opinion, I believe that Ms Jordan's evidence fails to consider research demonstrating that changes in land use on sheep and beef farms can deliver gains in all four contaminants in combination with viable business options for sheep and beef farmers in the Waikato River catchment under Plan Change 1 and Variation 1 (**PC1**). The growing focus on greenhouse gas management including the Zero Carbon Bill are leading to a high economic value on carbon sequestration which will provide further economic flexibility for low producing and erodible hill lands.

The Whatawhata Integrated Catchment Management Study

5. The Whatawhata Hill Country Research Station near Hamilton, was established in 1949 to support sheep and beef research. It is now owned by Waikato-Tainui and was leased by AgResearch until recently. From 1996 to 2001 I was the Project Leader for an Integrated Catchment Management project at Whatawhata. This project sought to apply a multi-discipline approach to achieving 'a 'well-managed rural hill country

catchment'. The process for, and short-term results of, this study are reported in Dodd et al (2008 a,b,c) with medium-term results in Dodd et al (2014) and Hughes and Quinn (2014).

6. The measures of 'well managed' were developed by a stakeholder group and are presented in Table 1

Table 1 Catchment management group-derived goals and indicators of a "well managed rural hill country catchment". No priority order is implied, and those specifically discussed in this paper are marked with an asterisk.

Goal sets	Indicators
Viable businesses	Economic farm surplus* Stock performance* Condition of farm infrastructure Return on business capital Soil fertility*
Healthy ecosystems	Amount of erosion susceptible land* Suspended solids in water* Plant nutrients in water* Diversity and numbers of sensitive water creatures* Plant growth*
Protected landscape values	Property valuation* Landscape diversity Clean water* Tidy work areas Healthy stock
Active partnerships	Compliance with regulations Recorded and protected historical and cultural sites Landowner independence in decision making Community participation in catchment group activities
Demonstrable environmental performance	Water quality levels* Numbers of complaints and awards Erosion levels* Animal welfare Pasture production*
Adequate rural services and infrastructure	Availability of suitable water for community purposes Profitability of rural enterprises (farming)* Viability of community activities Accessibility of basic services

7. The project focused on 296 ha of the Research Centre which was both a monitored catchment and managed as a stand-alone farm. The current state of the catchment-farm in 1996 was generally poor in relation to the indicators in Table 1 above. To achieve progress across all these goals, management and land use changes were made to

- a) intensify the pastoral farming on the better land with riparian fencing for cattle and soil conservation planting
- b) afforest the steeper and erosion prone land, and
- c) restore native bush remnants.

8. The consequences of these changes in the short-term were reported by Dodd et al (2008c) “...declines in sediment (76%) and phosphorus (62%) loads and faecal coliform (43%) levels were observed, native forest fragments showed early signs of recovery in terms of sapling numbers and vegetative cover, and the pastoral enterprise recorded increased per hectare production of lamb (87%) and beef (170%). There were implementation challenges with the better matching of land use to land capability, but this study demonstrated that significant progress can be made in the short-term.”
9. Longer-term water quality changes were not linear, as the waterways adjusted to factors such as changes in shading and water balance caused by land use change with both increasing and decreasing water quality indicators reported by Hughes and Quinn (2014).
10. The economic consequences of this change, including income from C sequestration, were reported by Dodd et al (2014). This paper shows similar per ha profitability from the livestock enterprise, similar overall profitability as a consequence of C payments (a very low \$5/t C assumed) but with a substantial capital cost of almost \$1M.
11. It is my opinion that the overall view of the Whatawhata results, in the context of Healthy Rivers, four contaminants and a C neutral economy is that the land use change implemented on this sheep and beef farm has shown significant gains in many of the indicators. It is my opinion that:
 - a) sheep and beef farmers do not require increases in N allocation to have land use flexibility and economic viability
 - b) it is possible to implement changes on sheep and beef farms that make significant gains in water quality
 - c) the capital required to support this change is significant, indicating the need for both time and potentially external funding.
12. In support of paragraph 11a above I refer back to my Block 2 evidence (paragraph 9), regarding N leaching mitigations, and the potential for plantain, low N emitting livestock and artificial wetlands to reduce N losses. All these options are available to sheep and beef farmers, with the research currently underway to prove their effectiveness being funded in large part by dairy farmers with support from government and agri-business.
13. These conclusions conflict with Ms Jordan’s evidence as I now explain.

14. In Paragraph 24 of Ms Jordan's evidence she states that "*The risks from agricultural land uses occur where it is intensified, without sound mitigations, and on vulnerable landscapes. The evidence is that the environmental risk associated with the red meat sector has been declining overtime.*"
15. The Whatawhata study shows that risks also occur when land use is inappropriate in the first place, and that selective intensification in a landscape combined with land use change can lead to improvement in both environmental and economic measures. While the Whatawhata study shows that these changes do reduce the risk associated with sheep and beef land farming I don't believe Ms Jordan has referenced evidence that shows that the environmental risk from sheep and beef farming has decreased other than through a decrease in land area occupied by sheep and beef farmers as a consequence of low profitability leading to lower total N leaching from the sector.
16. In paragraph 54 of Ms Jordan's evidence, she states that "*As set out in my evidence for HS1, it is more efficient and effective to seek that land uses internalise their externalities of concern. These will not be the same for each land use and is dependent on the landscape it occurs on*".

I generally agree with this statement, but I question whether BLNZ are addressing the total water quality impact (including sediment, phosphorus and E.coli) of the sector they represent. My evidence below outlines some important research findings that I understand have not been referenced by BLNZ in their evidence to PC1.

17. In paragraph 101 of Ms Jordan's evidence she states that "*...extensive farming systems have reduced viability – flexibility to operate and adjust to changes in markets climate and environmental conditions,...*"
18. It is my opinion that the Whatawhata study, shows that extensive farming systems do have flexibility without the need to increase nitrogen leaching, and that recent (and likely future) increases in the price of carbon add to this flexibility and viability. I have referenced some of the key publications that support my statements.
19. In his evidence, Mr Parkes sets out how a tailored farm plan approach can result in improvements to productivity and at the same time mitigate sediment, phosphorus and E.Coli (paragraph 37). I did not see any reference to the need to increase nitrogen inputs to achieve these productivity improvements.
20. In my opinion, implementing land management change driven by land use suitability as demonstrated at Whatawhata will lead to improvements in the other three water

contaminants (phosphorus, sediment, E. coli) and a reduction in greenhouse gas emissions. This is the type of change that is required to deliver on the Healthy Rivers vision.

16 May 2019



Bruce Thorrold

References

Dodd, M.B., Thorrold, B.S., Quinn, J.M., Parminter, T.G., Wedderburn, M.E., 2008a.

Improving the economic and environmental performance of a New Zealand hill country farm catchment: 1. Goal development and assessment of current performance.

New Zealand J. Agric. Res. 51, 127–141.

Dodd MB, Thorrold BS, Quinn JM, Parminter TG, Wedderburn ME 2008b. Improving the economic and environmental performance of a New Zealand hill country farm catchment 2. Forecasting and planning land-use change. New Zealand Journal of Agricultural Research 51: 143–153

Dodd, M.B., Quinn, J.M., Thorrold, B.S., Parminter, T.G., Wedderburn, M.E., 2008c. Improving the economic and environmental performance of a New Zealand hill country farm catchment: 3. Short term outcomes of land use change. New Zealand J. Agric. Res. 53, 155–169.

Dodd, M.B, Carlson, W., Silcock, P. 2014 The economics of transformation toward sustainable hill country land use: Whatawhata case study. Proceedings of the New Zealand Grassland Association 76: 163-168

Hughes, A and Quinn, J.M. 2014 Before and After Integrated Catchment Management in a Headwater Catchment: Changes in Water Quality Environmental Management (2014) 54:1288–1305