

**BEFORE THE ENVIRONMENT COURT**

*In the matter of* the Resource Management Act  
1991 (“the Act”)

*And in the matter of* the Proposed One Plan for the  
Manawatu-Wanganui Region

*Between* WELLINGTON FISH & GAME  
ENV-2010-WLG-000157

*And* FEDERATED FARMERS OF NEW  
ZEALAND  
ENV-2010-WLG-000148

*And* MINISTER OF CONSERVATION  
ENV-2010-WLG-000150

*And* DAY, MR ANDREW  
ENV-2010-WLG-000158

*And* HORTICULTURE NEW ZEALAND  
ENV 2010-WLG-000155

*And* **Appellants**  
MANAWATU-WANGANUI  
REGIONAL COUNCIL

**Respondent**

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**STATEMENT OF REBUTTAL EVIDENCE OF DR DAN MARSH ON BEHALF OF  
WELLINGTON FISH & GAME**

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## 1 INTRODUCTION

### **My qualifications and experience**

- 1 My full name is Dr Daniel Kenneth Vawdrey Marsh. A full description of my qualifications and experience was provided in my statement of evidence dated March 2012, which was filed with the Court and circulated to the parties.

### **Purpose and Scope of Evidence**

- 2 The purpose of this evidence is to respond to matters raised in the evidence of the following persons:
  - a. Mr Ballingall for Fonterra;
  - b. Mr Willis for Fonterra; and
  - c. Professor Tillman for Federated Farmers.

### **Expert Witness Code of Conduct**

- 3 I have been provided with a copy of the Code of Conduct for Expert Witnesses contained in the Environment Court's Consolidated Practice Note 2011 ("2011 Practice Note"). I have read and agree to comply with that Code. This evidence is within my area of expertise, except where I state that I am relying upon the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.
- 4 My evidence in chief accidentally referred to the 2005 Practice Note. I confirm that when I prepared my evidence in chief I had in fact read the 2011 Practice Note and that the reference in my evidence in chief should have been to the 2011 Practice Note.

## 2 Evidence of John Ballingall

5 In paragraph 35, Mr Ballingall states:

*“The POP Rules, depending on how they are designed and implemented, could impact heavily on the dairy sector in the Regional Economy. Given the importance of the dairy sector to the Regional Economy, including its links to other supplying and using industries in the economy, any negative impact on dairy production from the POP Rules is also likely to be felt well beyond the farm-gate.”*

6 In paragraph 60, Mr Ballingall states that he:

*“would expect a fully specified economic analysis of the Council’s POP Rules to identify the loss in dairy production across the region arising from these additional costs, including the potential closure of marginal farms...”*

7 In paragraph 67 in discussing the use of CGE models in New Zealand, Mr Ballingall cites work by NZIER and Infometrics (footnotes 27 & 28) but does not refer to work by Rae and Strutt (2011) which is more directly relevant.

8 I disagree with these conclusions and consider that they exaggerate the possible impact on the regional economy.

9 Mr Ballingall suggests that the relevant cost is the “loss in dairy production ... arising from ... closure of marginal farms”. If dairy farming becomes slightly less profitable, then a small number of landowners may decide over time to invest in alternative land uses. The effect of such a change on the regional economy can be estimated by any reduction in profit from changing land use from dairying to the next most profitable land use. A cost estimate based on closure of farms without considering the profitability of the new land use will exaggerate costs.

10 I also note that Horizons has proposed a policy gateway for those farms which are unable to meet the Table 13.2 LUC limits due to exceptional circumstances (including high rainfall in combination with high percentage of their land being of LUC class IV to VIII). This policy gateway is supported by WFG. The effect of this policy gateway is to reduce the possibility that landowners may decide to

invest in alternative land uses – so reducing any possible adverse effect on the regional economy.

11 Work by Rae and Strutt provides the most directly relevant information on macro level effects of regulating the dairy sector to reduce nitrogen leaching. I summarise their work in paragraphs 39-41 of my evidence in chief. They found national level dairy regulations to reduce nitrogen leaching by around 30% would have very little effect on national income as measured by GDP. They estimated a reduction in GDP of 0.03%. This slightly negative effect could be overshadowed by even a slight increase in demand for sustainable dairy products in world markets.

12 In paragraphs 72 & 73, Mr Ballingall states:

*“In the absence of better economic information, I consider that it would be prudent to adopt an approach to regulating for better water quality that is gradual in its implementation; allows farmers to adjust to the POP Rules in a fashion that does not cause them undue financial distress; and is monitored and reviewed regularly so as to ensure progress towards the stated environmental objectives while at the same time allowing the dairy sector to continue to contribute to the economic wellbeing of the Region.*

*The proposed requirements in the Decisions version of the rules (DV POP) would appear to present such an approach, with its emphasis on existing dairy farmers undertaking reasonably practicable steps to reduce Nitrogen loss on a case-by-case basis, and new entrants facing more stringent requirements.”*

13 In my evidence in chief I have summarised available ‘economic information’ to demonstrate that:

- a. A rule that requires ‘reasonably practicable steps’ will lead to little change in farm practice. The economics expert caucusing statement records the agreement of all parties, including Mr Ballingall, that *“there are difficulties in defining what this expression means, which may lead to a lack of certainty around outcomes.”*

- b. Based on the evidence of other witnesses, the implementation of the decisions version of the rules (DV POP) – will not lead to water quality improvements. As a consequence, implementation of DV POP will produce negligible benefits (if any).
- c. Given the negligible level of benefits (if any) the costs of DV POP are likely to exceed the benefits; whereas
- d. When the benefit of better water quality is assessed based on ‘willingness to accept’ the benefit of improved water quality resulting from implementation of the Notified Version (Wellington Fish and Game (“WF&G”) proposal)) will greatly exceed the cost of this policy.
- e. Furthermore, even based on the incorrect assumption that willingness to pay provides the correct measure of benefit, the benefits of the WFG proposal are likely to exceed the costs.

14 At paragraph 94 of his evidence, Mr Ballingall makes this statement in favour of a softer transition path:

*“The rate chosen for transitioning to a new regime involves a trade-off between: making a short, sharp reduction in pollution, with short term costs, but potentially earlier gains for the environment; and making a slower reduction path that allows easier adjustment but delays gains for the environment...In the absence of further analysis, my view is that a more flexible approach is necessary.”*

15 Mr Ballingall’s contention is based upon an assumption that the notified version (or WFG proposal) represents ‘a short, sharp reduction in pollution’ while the decision version represents a ‘slower reduction path’. In fact, technical evidence (by Olivier Ausseil and others) demonstrates that the decisions version would not lead to a reduction in pollution while the WFG proposal represents a slow reduction path.<sup>1</sup>

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<sup>1</sup> N leaching is gradually reduced over 20 years, but even after 20 years water quality targets are not met in most catchments.

16 Mr Balingall says in paragraph 110 that there is *“little empirical evidence to suggest that these [nitrogen trading] schemes have worked effectively or efficiently to date as most schemes are relatively new.”*

17 I do not agree with Mr Balingall’s statement, which assumes that we do not have evidence about the efficiency and effectiveness of trading schemes to reduce non-point source pollution. As an analogy, economists would not argue that we do not understand the trading conditions under which a *new* soft drink would be bought and sold. We would reasonably conclude that we have plenty of evidence on market conditions – based on the soft drinks which are already in the market. The same analogy can be applied to trading schemes aimed at reducing pollution.

18 There is a very large body of evidence on the efficiency and effectiveness of such schemes. A good example is provided by the sulphur allowance trading program adopted in the USA as part of the Clean Air Act amendments in 1990. Net economic benefits of this trading scheme are at least US\$700 million every year (Perman, Ma, Common, Maddison, & McGilvray, 2011, p. 193). Proposals for use of trading schemes as an effective and efficient mechanism to reduce non-point source pollution (e.g. Nitrogen leaching) are far from new. The seminal works in this area date back to 1988 and 1993. (Russel & Shogren, 1993; Segerson, 1988).

19 Mr Balingall concludes (paras 118 & 121) that there is not *“sufficient cost-benefit information to make firm conclusions regarding the economic impact of the POP Rules”* ... and that *“on balance, the DV POP appears to provide a degree of flexibility that may be warranted given the lack of comprehensive evidence of the costs and benefits of the proposed changes.”*

20 I do not agree with this statement. My evidence-in-chief establishes that:

- a. the benefits of better water quality resulting from implementation of the Notified Version (WFG proposal) will greatly exceed the cost of this policy; and

- b. the DV POP will not lead to water quality improvements and the costs of this regime are likely to exceed its benefits.

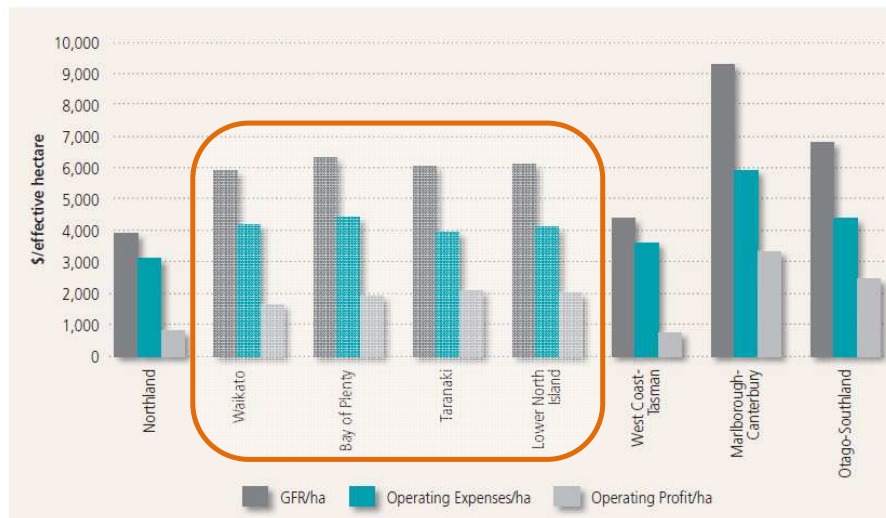
### 3 Evidence of Gerard Willis

21 Mr Willis (and Mr Ballingall) assert that research findings from outside the Manawatu region are not directly relevant to the current case. This assertion is incorrect. Key dairy farming parameters are similar over much of the North Island area – see for example Figure 5.14 (below) extracted from the Dairy NZ Economic Survey 2009-10. This shows that the average levels of gross farm revenue, operating expenses and operating profit per hectare are similar for the Waikato and the lower North Island.

22 Similarly, an extract from Table 5.7 (below) in the same report shows similar levels of stocking rate (2.8 vs 2.9), milk solids per hectare and milk solids per cow in the Lower North Island (e.g. Manawatu) and the Waikato.

**Figure 1 Comparison of Expenses and Profit Waikato vs Lower North Island**

*Figure 5.14: Regional GFR, Operating Expenses and Operating Profit per ha, 2009-10*



*Extracted from Figure 5.14 – Dairy NZ Economic Survey 2009-10*

**Table 2: Physical Characteristics Waikato vs Lower North Island**

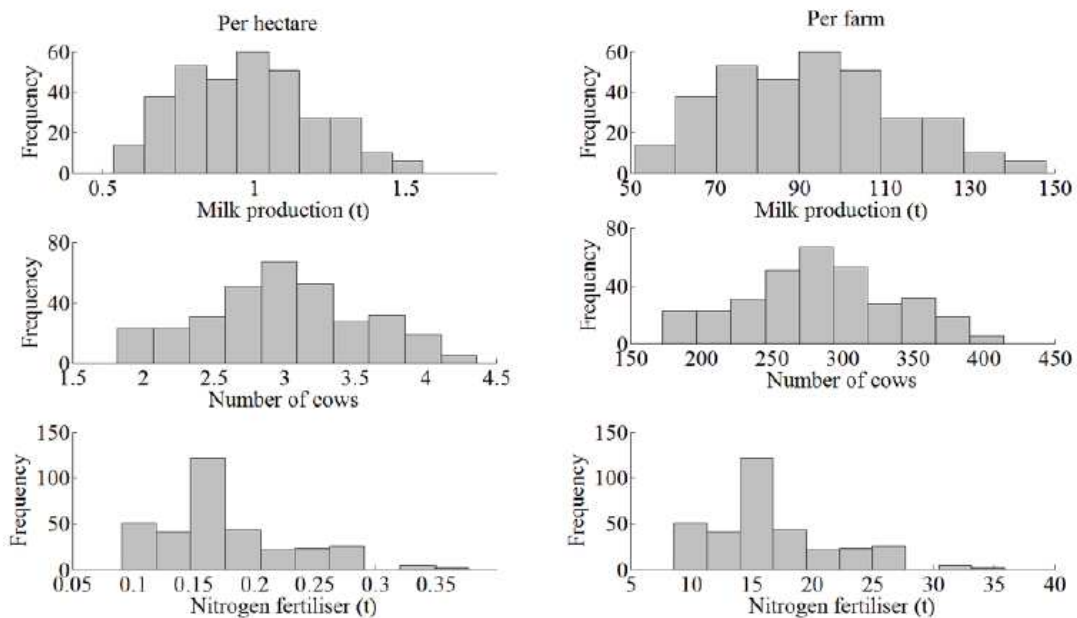
	<i>Northland</i>	<i>Waikato</i>	<i>Taranaki</i>	<i>Lower NI</i>
<b>PHYSICAL CHARACTERISTICS:</b>				
Number of herds	28	64	33	21
Effective area (ha)	126.8	112.0	96.1	134.7
Peak cows milked	288	323	274	375
Stocking rate (cows/effective area)	2.3	2.9	2.9	2.8
Kg Milksolids sold	74,223	98,595	90,531	124,910
Milksolids sold per hectare	585	880	942	927
Milksolids sold per cow	258	306	330	333
FTEs	2.2	2.4	2.2	2.5
Cows per FTE	131	135	125	152
Milksolids sold per FTE	33,825	41,136	41,179	50,534

*Extracted from Table 5.7 – Dairy NZ Economic Survey 2009-10*

23 Work by Doole et al., was based on a detailed simulation of a catchment with characteristics as detailed in Figure 2 below. Average values for some key parameters for the simulated catchment include 313 kg milksolids per cow (cf., 333 for lower North Island - NI) and stocking rate 3.0 per hectare (cf., 2.8 Lower NI). These average values are similar to the levels reported for dairying in much of the Manawatu Wanganui region.



**Figure 2 Key Parameters from Work by Doole et al.,**



**Figure 2. Probability distributions of milk production, cow number, and nitrogen fertiliser use per hectare and per farm**

Extracted from Doole, Marsh, & Ramilan, 2011 (2011 )

24 Dr Doole has a considerable academic reputation (Best article in the Australian Journal of Agricultural and Resource Economics 2005 & 2008, Australian Young Agronomist of the Year 2010, Agricultural Economics Society (UK) prize essay competition 2010). The work that I refer to, in contending that costs are lower than suggested by Neild and Rhodes, has been subject to rigorous academic scrutiny and has been published in international peer reviewed journals (Australian Journal of Agricultural and Resource Economics, Land Use Policy, Journal of Agricultural Economics etc). As such it is worthy of careful consideration alongside the evidence of Neild and Rhodes (which was not subject to a similar level of scrutiny before being published).

25 I contend that key dairy farming parameters in the Waikato and the lower North Island are similar and, as such, the findings from the work of Doole et al., are highly relevant to a consideration of the likely costs of the Proposed One Plan.

26 Mr Willis writes (Appendix 1, paragraph 22) that:

*“From a planning perspective the difficulty I have with Dr Marsh’s analysis is that it does not tell us anything about the water quality benefit that is represented by the \$26 million dollar per year figure. As the modelling shows, many of the scenarios could be expected to produce a benefit relative to current water quality. It is just that some will do so more than others. Dr Marsh’s evidence does not help with that other than to suggest that less certain benefits need to be discounted (as he explains in paragraph 133).”*

27 I will deal with the above statement point by point. Firstly, Mr Willis writes *“it does not tell us anything about the water quality benefit that is represented by the \$26 million dollar per year figure”*. This is not correct. The water quality benefit represented by the \$26 million dollar figure is carefully and accurately described in my evidence in chief. In particular, my evidence in chief states:

*“\$26 million per year represents the benefits of the approach proposed by Wellington Fish and Game; a policy that will lead to water quality improvements – as compared to a policy of ‘business as usual’ that would allow water quality to continue to deteriorate”* (see paragraphs 136-137 of my evidence in chief).

28 Mr Willis goes on to write *“As the modelling shows, many of the scenarios could be expected to produce a benefit relative to current water quality.”*

29 This is not correct. The evidence presented by witnesses for WFG shows that overall water quality will deteriorate for all scenarios except for the WFG proposal and perhaps the current Horizons proposal (CB-POP). In other words, only the WFG proposal and possibly the current Horizons proposal will produce a benefit relative to current water quality.

30 In using the words *“a benefit relative to current water quality”* Mr Willis may be referring to a benefit relative to the current *trend* in water quality. In other words, current water quality is deteriorating and many of the scenarios could be expected to reduce this rate of deterioration. As I explained in paragraphs 130-131 of my evidence in chief, this benefit is likely to be small.

31 Mr Willis goes on to state “Dr Marsh’s evidence does not help with that other than to suggest that less certain benefits need to be discounted (as he explains in paragraph 133).” I will summarise the main points from my evidence below on the level of benefits of alternative scenarios.

**Table 1 Summary of Evidence on Benefits of Alternative Scenarios**

<b>Scenario</b>	<b>Expected Water Quality Trend</b>	<b>Benefit Estimate</b>
‘Business as Usual’ (BAU) <i>Current trends continue</i>	Water quality continues to deteriorate	Zero (this is the baseline for benefit estimation)
Decisions Version (DV-POP)	Water quality deteriorates – but not so fast as with BAU.	Small and uncertain <sup>2</sup> [Less than \$2 million]
Horizons Proposal (CB-POP)	Water quality <i>may</i> improve in most catchments	Less than \$13 million per year <sup>3</sup>
Wellington Fish and Game Proposal	Water quality expected to improve in all <sup>4</sup> catchments	\$26 million per year

32 Mr Willis writes “As I understand it, the economic witnesses have not reached a common view on the veracity of the numbers provided by Dr Marsh”.

33 The above statement understates the degree of agreement that was reached by the expert witnesses. The following relevant statements are extracted from the record of technical conferencing on the economic sub-topic.

- a. *“All Parties agree that the Wellington Fish and Game proposal benefits in terms of water quality would be expected to be higher than the Fonterra proposal which in turn would be expected to be higher than the Fonterra and Decisions version proposal”.* This quotation demonstrates that all economists agreed on the ranking of the relative size of benefits, as detailed in Table 1 above.

<sup>2</sup> Little evidence is available that would allow us to estimate the benefit of ‘water quality that deteriorates – but not so fast as with BAU’. An indication of the upper bound is provided by Marsh (2010); median willingness to pay for a slight improvement in water quality was \$26 per household per year. This would equate to \$2.4 million for households in Manawatu Wanganui Region. Clearly willingness to pay for a reduce rate of deterioration will be less than willingness to pay for a slight improvement.

<sup>3</sup> Technical experts for Wellington Fish and Game consider that the probability of DV-POP leading to water quality improvements is less than 50%. Accordingly benefits have been adjusted by this probability - \$26 million x 0.5 = \$13 million.

<sup>4</sup> With possible exception of Waikawa

- b. Mr Neild and Mr Rhodes *“agree that Dan Marsh’s evidence which states that MWRC residents and recreational users would be willing to pay in excess of \$6 million per year for better water quality in the region is plausible.”*
- c. My estimate of \$26 million per year is based on the fact that residents have rights to water quality that is not deteriorating. In this regard, it is important to note that *“All parties agree that the appropriate measure of benefits depends on Property Rights and if people have rights to water quality that is not deteriorating then willingness to accept (WTA) provides the appropriate benefit measure”*.

34 Mr Willis recommends in paragraph 141 of his evidence that *“Rule 13-1 should provide for existing dairy farms in targeted catchments as controlled activities provided: 141.1 They do not leach N at a rate greater than the highest leaching rate experienced on that farm over the period 2007-2010 (the “grandparented rate”); and 141.2 If the grandparented rate exceeds a benchmark of 27 kg N/Ha/Year then those existing farms will also be required to meet a N leaching limit which is considered to be achievable following consideration by the consent authority of N leaching mitigation measures that would be reasonably practicable for the farm to undertake.*

35 At paragraph 154 of his evidence, Mr Willis outlines that the rules he proposes would allow farmers in the bottom 75% to apply for consent to increase their nitrogen leaching rate above the “grandparented cap” he proposes.

36 I understand that the effect of the changes proposed above could be to increase the overall level of leaching beyond that which is presently occurring.

37 I understand that the water quality outcome of the provisions proposed by Mr Willis may be no better than the outcome expected for the Decisions Version. Given that up to 75% of farms could conceivably end up leaching amounts greater than the “grandparented cap,” and the uncertainty associated with “reasonably practicable” farm management practices to reduce nitrogen leaching, the water quality outcome could be worse.

38 The proposed change could lead to a continuing decline in water quality and, therefore, would not be *effective* in achieving plan objectives.

39 The proposed change would also not be *efficient*. The benefits (if any) would be small and would not exceed costs.

40 Mr Willis correctly notes (footnote 62 on page 51) that Doole and Panell (2011) does not appear in my list of references. I apologise for this oversight. This article was originally published on-line in 2011 and appeared in the print version of AJARE in 2012. The citation should read Doole and Panell (2012).

#### 4 Evidence of Russell Tillman

41 In discussing possible ways of allocating the nutrient cap Professor Tillman refers (paragraph 24) to economic efficiency and states that “an important test is the extent to which each option reduces the economic benefits generated by farming operations”. In the previous sentence he says that commercial farming should generate an economic benefit for the farmer, the region and the country.

42 Professor Tillman states that the LUC allocation system is not “economically efficient”. Mr Tillman is correct. An economically efficient allocation system will allocate the nutrient cap in order to minimise the overall cost of reduced leaching. The LUC allocation system does not include a direct mechanism to enable it to respond to the cost of reducing leaching and so is unlikely to be economically efficient.

43 In paragraph 138 of my evidence in chief I suggested that “the LUC approach recommended by WFG should be further refined in order to reduce costs for farmers and improve environmental outcomes. This would involve a) ensuring that the catchment level cap implied by the LUC approach is appropriate b) a mechanism to ensure that LUC allocations if fully taken up (through trading or land use change) do not allow leaching to increase in catchments where water quality standards are not met; and c) a low cost and transparent mechanism to encourage trading of N allocations within catchments – in order to allow flexibility for individual landowners while reducing the overall cost of reducing N leaching”.

44 Professor Tillman goes on to propose that an approach similar to that proposed in the DV POP is most appropriate. I do not agree with this proposal and contend that such a policy will not be economically efficient.

45 The policies proposed under DV POP will lead to a continuing decline in water quality and will not be *effective* in achieving plan objectives. The proposed change would also not be *efficient* since the benefits (if any) would be small and would not exceed costs.

46 Out of the policies 'on the table' the policies proposed by WFG will be most effective and also most efficient (e.g. having the largest net benefit for the region and for the country).

**Dr Dan Marsh**

**April 2012**

## References

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