BEFORE THE INDEPENDENT COMMISSIONERS

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of the Proposed Variation 1 to the Proposed Canterbury Land and Water Regional Plan

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REBUTTAL EVIDENCE OF MR BRETT STANSFIELD ON BEHALF OF NORTH CANTERBURY FISH AND GAME COUNCIL AND THE ROYAL FOREST AND BIRD PROTECTION SOCIETY

September 2014

North Canterbury Fish and Game Council

Environmental Advisor – Scott Pearson

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1. My name is Brett Stansfield.

2. My experience and qualifications are set out in my Evidence in Chief.

3. In preparing this evidence I have reviewed the EIC of:

   a) Mr. Geoffrey Edward Deavoll on behalf of the Director General of Conservation

   b) Dr. Greg Ryder on behalf of CPW Limited;

   c) Shirley Hayward on behalf of Dairy NZ & Fonterra

   d) Mr Gerard Willis on behalf of Dairy NZ and Fonterra

   e) Dr. Nicholas Dunn on behalf of the Director General of Conservation

   f) Dr. Alistair Humphrey on behalf of the community and public health division of the Canterbury District Health Board

   g) Dr. R Wilcock on behalf of Te Runanga O Ngai Tahu

   h) Cathy Begley on behalf of Te Runanga o Ngai Tahu

Expert Witnesses Code of Conduct

4. I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note. This evidence has been prepared in accordance with it and I agree to comply with it. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

RAMSAR Status Of Lake Ellesmere / Te Waihora

5. I wish to correct an error in my initial evidence regarding the RAMSAR status of Te Waihora / Lake Ellesmere. In paragraph 22 I had stated that “Te Waihora is a RAMSAR wetland of international importance due to its large number of resident and migratory birds (166 species recorded) occupying its extensive periodically inundated marginal and wadeable habitat.”

6. A more accurate description is Te Waihora has been recognized as a site of international significance in the Directory of Wetlands in New Zealand published by the Department of Conservation in 1996 (Cromarty et al. 1996). Lake Ellesmere / Te Waihora also meets the criteria of an internationally significant wetland under the 1971 RAMSAR agreement on wetlands although the process of formal recognition has not been completed by the Department of Conservation.

The NZCPS

7. I disagree with Mr. Deavoll's statement of evidence (paragraph 14) when he states, " I consider Variation 1 gives effect to the objectives and policies of the NZCPS."

8. There are two areas where, in my opinion, Variation 1 does not give effect to the NZCPS. These relate to water quality and indigenous biodiversity.

9. Objective 1 of the NZCPS refers to maintaining and enhancing water quality.

Objective 1

To safeguard the integrity, form, functioning and resilience of the coastal environment and sustain its ecosystems, including marine and intertidal areas, estuaries, dunes and land, by:

- maintaining coastal water quality and enhancing it where it has deteriorated from what would otherwise be its natural condition, with significant adverse effects on ecology and habitat, because of discharges associated with human activity.

Policy 21: Enhancement of water quality

Where the quality of water in the coastal environment has deteriorated so that it is having a significant adverse effect on ecosystems, natural habitats, or water-based recreational activities, or is restricting existing uses, such as aquaculture, shellfish gathering, and cultural activities, give priority to improving that quality by:

(a) identifying such areas of coastal water and water bodies and including them in plans;

(b) including provisions in plans to address improving water quality in the areas identified above;

(c) where practicable, restoring water quality to at least a state that can support such activities and ecosystems and natural habitats.

10. As set out in my statement of evidence, Te Waihora is highly polluted (paragraph 46) and it is widely acknowledged that the life supporting capacity of the lake has been drastically reduced. The deterioration of water quality in Te Waihora / Lake Ellesmere has caused significant adverse effects on its ecology and habitat (paragraph 86).

11. Modeling undertaken on behalf of the Zone Implementation Committee demonstrates nitrogen and phosphorous loads to Te Waihora / Lake Ellesmere have caused a decrease of its water quality. Further increases of nitrogen and phosphorus load will result in further decreases in water quality. Given that Objective 1 and Policy 21 provide for the enhancement of water quality where water quality is having significant adverse effects on ecology and habitat, this outcome appears to be inconsistent with Objective 1 and Policy 21 of the NZCPS and does not give effect to Objective 1 and Policy 21 of the NZCPS.

12. The second area relates to the effects of eutrophication on indigenous biodiversity.

13. Eutrophication can have significant adverse effects on indigenous biodiversity. The following studies support the view that increased eutrophication can lead to adverse effects on indigenous biodiversity of wetland ecosystems like Te Waihora / Lake Ellesmere.

(a) Ogle (1991) provides a case study in which diverting water from a nutrient rich wetland to an adjacent wetland of lower nutrient status resulted in a dramatic loss of indigenous flora and fauna of the previously lower nutrient status wetland. The loss of biodiversity was attributed to changes in water level and water quality regimes.

(b) Deegan et al (2012) have identified eutrophication of coastal systems as a key driver of salt marsh habitat loss.

(c) McKinnon & Mitchell (1994) provided a classic food chain study that demonstrates that the eutrophication of a lake can lead to decreased size of winter swan populations. The authors demonstrated that winter swan numbers were directly correlated with the biomass of submerged macrophytes.

(d) Clarkson (2003) notes that increased nutrient inputs inevitably lead to adverse changes to water quality and vegetation composition and structure of wetlands.

14. Policies 11a and 11b of the NZCPS state:

Policy 11: Indigenous biological diversity (biodiversity)

To protect indigenous biological diversity in the coastal environment:

(a) avoid adverse effects of activities on:

- indigenous taxa[1] that are listed as threatened or at risk in the New Zealand Threat Classification System lists;
- taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;
- indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare[2];
- habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;

[1] Named biological classification units assigned to individuals or sets of species (e.g. species, subspecies, genus, order, variety)

[2] Originally rare: Rare before the arrival of humans in New Zealand.

- areas containing nationally significant examples of indigenous community types; and
- areas set aside for full or partial protection of indigenous biological diversity under other legislation; and

(b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:

i. areas of predominantly indigenous vegetation in the coastal environment;

ii. habitats in the coastal environment that are important during the vulnerable life stages of indigenous species;

iii. indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dune lands, intertidal zones, rocky reef systems, eelgrass and saltmarsh;

iv. habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes;

v. habitats, including areas and routes, important to migratory species; and

vi. ecological corridors, and areas important for linking or maintaining biological values identified under this policy.

15. In terms of the above clauses of the NZCPS:

(a) There are 3 globally threatened species of birds that also have national threat status (Australasian bittern, nationally endangered, Black Stilt, nationally critical and Wrybill, nationally vulnerable) and a further three nationally threatened species (Pied Stilt, declining, Banded Dotterel, nationally vulnerable, South Island Oyster Catcher, declining). There are likely to be many more threatened bird species within Lake Ellesmere as it provides habitat to some 166 species of birds, however I have not had time to check the threat status of all 166 birds, suffice it to say there are many threatened birds that inhabit the wetland areas of this lake.

(b) Threatened fish species of the lake include longfin eel (declining) torrent fish (declining), and inanga (declining).

(c) Te Waihora / Lake Ellesmere contains indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare. Of note are the salt marsh and associated brackish wetland areas that are particularly rare in New Zealand. Endangered species of plants include the coastal sedge *Desmoschoenus spiralis* and the perennial herb *Mimulus repens* (naturally uncommon).

(d) Te Waihora / Lake Ellesmere contains nationally significant examples of indigenous community types. As noted above Te Waihora / Lake Ellesmere is a wetland of international significance.

16. Policy 11(a) provides that adverse effects on these biodiversity features should be avoided. As noted above, nutrient loads can adversely affect the ecology and habitat of ecosystems like Te Waihora / Lakes Ellesmere. Further increases in nutrient load will increase these adverse effects.

17. I support Mr. Deavoll's statements (paragraphs 20 to 24) regarding the prohibition of damming to ensure that mudfish habitat within the Selwyn River / Waikirikiri and Waianiwaniwa Valley remain significant in supporting an abundant stable mudfish population and thereby giving effect to section 6c of the RMA and Objective B1 of the NPSFM.

18. I also support the statement of evidence provided by Dr. Nicholas Dunn with respect to the prohibition of stream damming (paragraph 17) of the Waianiwaniwa River tributaries.

ICOL vs. Brackish Lake

19. In paragraph 12 of the statement of evidence provided by Shirley Hayward she states that "it has been clarified recently that the lake attributes in the NPSFM 2014 were not intended to apply to lakes such as Te Waihora / Lake Ellesmere and Coopers Lagoon, because these lakes can be classified as intermittently closing and opening lagoons (ICOLs)." She continues with "Shallow brackish ICOLs such as Te Waihora / Lake Ellesmere have quite different trophic responses compared to deep freshwater lakes for which the NPS FM 2014 attribute states were intended". These views are shared by Gerard Willis statement of evidence (paragraph 175, 176, 178,179).

20. In my evidence in chief I stated that Lake Ellesmere is a brackish lake (paragraph 23) and made comparisons of water quality of Lake Ellesmere with the NPSFM (paragraph 50). My classification of it being a brackish lake stems from my opinions plus recent published research in which it is stated as such (Kelly & Jellyman 2007).

21. I recently spoke with Professor David Hamilton of the University of Waikato on the subject of whether Lake Ellesmere is an ICOL or a brackish lake (pers. comm. 3 September 2014) to which he said, "I don't know". He also stated that he and a host of other experts had recently been asked by MFE to provide criteria for the NPSFM for ICOLS. He voiced an opinion that "the limits for ICOLS are likely to have similar (nutrients – TN and TP) or MORE STRINGENT (chlorophyll a) conditions as those specified for brackish lakes".

22. Whether Lake Ellesmere becomes classified as a brackish lake or an ICOL, there is a strong likelihood that it will not meet the required bottom lines of the NPSFM. In stating

this I also defend my evidence paragraph 50 that is also verified by Shirley Hayward's statement of evidence paragraph 23.

Raising Lake Water Levels And TLI Targets

23. I support Dr. Robert Wilcock's statement of evidence paragraph 12 in recommending raising water levels to reduce wind driven suspension of lake sediment to assist with encouraging aquatic macrophyte growth. I had not considered this mitigation option in my statement of evidence, as the Zone Committee had not recommended it.

24. I also support Dr Robert Wilcock's vision of a long term goal TLI of 4.8 (paragraph 21). In my statement of evidence I had suggested a TLI of 5.5 midlake and 5.0 for the lake margins (paragraph 96) over the long term and had broken this down to targets of mid lake 6.0, margins 5.5 by 2037 and mid lake 5.5, margins 5.0 by 2050. These targets are very similar to what Dr. Wilcock is suggesting in paragraph 21 of his evidence.

25. I support Dr Wilcock's statement of evidence paragraph 20 with respect to reducing sediment inputs of farm drainage discharges.

Minimum Flows

26. I concur with Cathy Begley's statement of evidence that points out the need to raise minimum flows in the lowland streams and concern of Variation 1's failure to address over allocation of these zones (paragraph 41 & 42). I also concur with her statement made in paragraph 44 regarding uncertainty in predicting water availability if CPW becomes operational as well as the need to phase out over allocation if CPW is not as successful as anticipated.

27. While paragraph 46 of Cathy Begley's evidence recommends a minimum flow of 260 l/s for Hamner Road Drain, which considers cultural health flow requirements; my recommendation is for a minimum flow of 332 l/s that is 90% of MALF as specified by the proposed National Environmental Standards on Ecological Flows and water levels (MFE 2008). I would anticipate that by having a minimum flow at this value, both ecological and cultural requirements would be met.

28. I concur with Cathy Begley's statement of evidence (paragraph 47) with respect to the minimum flow requirement for the Hororata River. She points out that the variation 1 minimum flow is inconsistent with the minimum flow of the ZIP Addendum of 382 l/s. I would also add that it is also inconsistent with the minimum flow recommended by Golders (2012). As stated in my evidence (Appendix 1) the minimum flow for this river should be set at 382 l/s.

29. Dr. Greg Ryder's statement of evidence paragraph 22 outlines work undertaken by Burrell (2011) and provides a table (table 4) of the effects irrigation (scenario 2) has compared to the current state of the river and stream systems. I wish to point out that for most of the streams classified as sensitive to flow variation, there are almost negligible

decreases in the percentage of time spent below ecological flow as a result of irrigation. The exception to this is the Selwyn River. Given that these streams are already over allocated, the calculated improvements in table 4 give me little confidence that an ecological improvement will result.

30. I also wish to point out that the assessment of sensitivity has been based on instream habitat quantity rather than habitat quality. Of importance are the effects of flow levels on water temperature and dissolved oxygen concentrations.

31. In paragraph 23 Dr. Ryder states “In medium-sized, deep, and predominantly soft bottomed rivers in the lower catchment, small flow variations have little effect on wetted channel width, and therefore habitat availability in these waterways is not considered sensitive to small or moderate variation in flow (Burrell 2011).” However no discussion is provided on what effect lowering flows may have on dissolved oxygen and water temperatures of the affected streams. In my view lowering flows in U shaped channels may not reduce wetted habitat, however water temperatures may rise significantly and dissolved oxygen concentrations could drop.

32. Water quality models such as DO FLO (NIWA) or WAIORA are available to determine the effects lowered flows can have on dissolved oxygen concentrations, total ammonia concentrations, pH and water temperature, however these have not been investigated and in my view need to be. In my view if these effects are not investigated then the minimum flows I have specified in my statement of evidence table (Appendix 1) should prevail. I have provided some rationale as to why these minimum flows should be set in paragraph 72 of my evidence.

33. In paragraph 30 of Dr Ryder’s statement of evidence he provides comment on the improvements likely to occur in the Selwyn River. He states, “Based on this information and my experience, I concluded that the predicted 28% reduction time spent below the ecological flow as a result of irrigation can therefore be expected to have a positive effect on aquatic communities. “ This statement takes no consideration of the secondary effects of intensifying land use i.e. the increased nutrient load giving rise to higher nutrient concentrations in the receiving stream water and the effects this may have on aquatic macrophyte and periphyton growths and ultimately changes to wider aquatic ecosystem health.

Uncertainty of Modeling

34. In paragraph 55 of my evidence I stated, “In my view many of the mitigation methods of the various scenarios are in fact experiments for which the outcome of their success is unknown.” I have also stated in paragraphs 65 and 66 on the compounding effects of error in the models used to predict the likely consequences of the various scenarios

35. This is supported by Shirley Hayward’s statement of evidence (paragraph 13) that states, “Many uncertainties remain in the predictions of the effects of the regulatory measures

proposed in variation 1. This includes uncertainties of the estimate of the nitrogen load that is yet to come from time lags in the catchment. Also there is uncertainty around how the lake is likely to respond to inlake and near lake mitigation measures."

36. Uncertainties are again expressed in Shirley Hayward's statement of evidence in paragraphs 45, 61 and 62.

Dual Nutrient Management

37. I concur with Shirley Hayward's comment (paragraph 14) of the need to carefully manage nitrogen and phosphorus loads to Te Waihora/ Lake Ellesmere in order that the broader objectives of Variation 1 and the Zone Committee may be successfully achieved in the long term. This supports my view (paragraph 81) that dual nutrient management is necessary for the incoming tributaries to ensure a desired TLI of the lake is met.

38. Dr Robert Wilcock also supports dual nutrient management in his statement of evidence paragraph 43 which I also agree with.

39. Dr. Greg Ryder's comments in paragraph 39 of his statement of evidence seem to discount measuring N or P in the rivers where he says "No outcomes or limits are proposed for nutrients (either N or P), however this is not necessary in my opinion if the ecological outcomes for invertebrate communities, macrophytes, periphyton and general water quality are met."

40. Unfortunately Dr. Ryder's statement takes no consideration of riverine N and P loadings to the lake for which targets have been set. While there is some merit with Dr. Ryder's view regarding the ecological outcomes for invertebrate communities, macrophytes and periphyton, my view is that the latter two ecological indicators are highly variable in nature and in fact the preferred indicator of ecosystem health is macroinvertebrate communities.

41. In paragraph 104 I have suggested removing the periphyton and macrophyte variables form Table 11c due to their high variability in measuring the achievement of outcomes. In saying this I am not discounting that these are important ecological variables to monitor, particularly if the council is interested in researching macroinvertebrate and periphyton or macrophyte relationships. In my view there is a stronger likelihood of measuring success of ecological outcomes using the macroinvertebrate communities because they are generally less spatially and temporally variable.

Nitrate Nitrogen Limits Set in Plan Variation 1

42. I need to clarify that one of the reasons I disagree with the nitrate nitrogen limits specified in table 11k is because they do not meet the requirements for achieving ecosystem health in this catchment. This should have been stated as the first sentence in paragraph 106 of my evidence.

43. In Table 1 and paragraph 113 of my evidence I demonstrated that a lot of variability of nitrate nitrogen concentration exists within each management unit. Therefore applying a blanket nitrate nitrogen concentration limit to a management unit e.g. spring fed plains poses the risk of allowing greater contamination of some rivers compared to others.

44. In paragraph 38 of Shirley Hayward's evidence she states "The data show that spring-fed plain streams have generally high NNN concentrations, which reflect the dominant influence of nitrate rich groundwater inflows, and therefore the NNN limits proposed for these river types are realistic and appropriate."

45. I disagree with this statement as I have clearly demonstrated that some stream systems within the spring fed plains management unit (e.g. Irwell River, Jollie's Brook & Lee River) have comparatively low concentrations of nitrate nitrogen when compared to other rivers or streams of the same management unit.

46. In paragraph 39 of Shirley Hayward's statement of evidence she also points out that the Selwyn River at Coes Ford has elevated NNN concentrations. My results (Table 1 of my evidence) also show that this river has high nitrate nitrogen concentrations. She also points out that the lower Selwyn River at Coes Ford has a healthy macroinvertebrate community. However my analysis of macroinvertebrate data from 1999 to 2013 shows high variability for this site (minimum 2.3 recorded 2008, mean 5.1, maximum 7 recorded 2000). On average this means the aquatic ecosystem health represents possible mild pollution, however the variability suggests it can range from severely polluted (QMCI<4), to excellent (QMCI > 6). The reason for the high variability of QMCI values at this site is unclear and would warrant further investigation.

47. Shirley Hayward in paragraph 38 has supported re-classifying the lower Selwyn River to a spring-fed plains management unit, with a significant N toxicity limit increase relative to Table 11(K). I do not support this change as it would be well above the current state levels as shown in my EIC for the Selwyn at Coes Ford. This suggestion further reinforces my EIC comments that the nitrate nitrogen river management unit limits are blunt instruments that do not effectively account for variability between rivers, as the higher limits proposed by Hayward for this location, would not effectively maintain or enhance present water quality.

48. I also do not support the request by Gerard Willis in paragraph 197- 200 of his EIC, to significantly increase the limits for the "hill-fed lower" river management unit due to the Hawkins, Hororata and Waianiwaniwa also being included in the hill fed lower river management unit within table 11 a of variation 1. I also note that in Appendix 1 of Mr Willis' evidence he has shown the lower Selwyn River at Coes Ford being moved to the spring fed plains management unit. As stated immediately above, I do not think this change will effectively maintain water quality at this location. Given the high past values and potential high future values through enhancement of the lower Selwyn River, I do not

support increasing limits above the current state as it will not be in keeping with the objectives and policies of the proposed Canterbury Land and Water Regional Plan.

49. In place of the reasons provided by Hayward and Willis above, I would instead refer you to the values noted in my own evidence and that of Pearson (EIC, 2014) where the significant trout fishery values and other ecological processes affected by the water quality of this tributary, should be matched by objectives that will achieve life supporting capacity and reduce degradation of ecosystem health.

Brett Stansfield

8 September 2014

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