BEFORE THE ENVIRONMENT COURT
I MUA I TE KOOTI TAIAO O AOTEAROA

UNDER	the Resource Management Act 1991
IN THE MATTER	of appeals under Clause 14 of the First Schedule of the Act
BETWEEN	**TRANSPOWER NEW ZEALAND LIMITED** (ENV-2018-CHC-26)
	FONTERRA CO-OPERATIVE GROUP (ENV-2018-CHC-27)
	HORTICULTURE NEW ZEALAND (ENV-2018-CHC-28)
	ARATIATIA LIVESTOCK LIMITED (ENV-2018-CHC-29)
	WILKINS FARMING CO (ENV-2018-CHC-30)

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STATEMENT OF REBUTTAL EVIDENCE OF EWEN RODWAY ON BEHALF OF THE SOUTHLAND REGIONAL COUNCIL
27 May 2019

Judicial Officer: Judge Borthwick

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WYNNWILLIAMS

GORE DISTRICT COUNCIL, SOUTHLAND DISTRICT COUNCIL & INVERCARGILL DISTRICT COUNCIL
(ENV-2018-CHC-31)

DAIRYNZ LIMITED
(ENV-2018-CHC-32)

H W RICHARDSON GROUP
(ENV-2018-CHC-33)

BEEF + LAMB NEW ZEALAND
(ENV-2018-CHC-34 & 35)

DIRECTOR-GENERAL OF CONSERVATION
(ENV-2018-CHC-36)

SOUTHLAND FISH AND GAME COUNCIL
(ENV-2018-CHC-37)

MERIDIAN ENERGY LIMITED Act 1991
(ENV-2018-CHC-38)

ALLIANCE GROUP LIMITED
(ENV-2018-CHC-39)

FEDERATED FARMERS OF NEW ZEALAND
(ENV-2018-CHC-40)

HERITAGE NEW ZEALAND POUHERE TAONGA
(ENV-2018-CHC-41)

STONEY CREEK STATION LIMITED
(ENV-2018-CHC-42)

THE TERRACES LIMITED
(ENV-2018-CHC-43)

CAMPBELL'S BLOCK LIMITED
(ENV-2018-CHC-44)

ROBERT GRANT
(ENV-2018-CHC-45)

SOUTHWOOD EXPORT LIMITED, KODANSHA TREEFARM NEW ZEALAND LIMITED, SOUTHLAND PLANTATION FOREST COMPANY OF NEW ZEALAND
(ENV-2018-CHC-46)

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

PETER CHARTRES
(ENV-2018-CHC-48)

RAYONIER NEW ZEALAND LIMITED
(ENV-2018-CHC-49)

ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND
(ENV-2018-CHC-50)

Appellants

AND **SOUTHLAND REGIONAL COUNCIL**

Respondent

Introduction

1 My full name is Ewen Maurice Rodway

2 My qualifications and experience are set out in my Statement of Evidence in Chief dated 14 December 2018.

3 As with my Evidence in Chief, I confirm that I have read and am familiar with the Code of Conduct for expert witnesses contained in the Environment Court consolidated Practice Note 2014. I agree to comply with that Code. Other than where I state that I am relying on the evidence of another person, my 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 that I express.

Scope of Rebuttal Evidence

4 In my rebuttal evidence I provide a response to the following matters as raised in the evidence of:

(a) Linda Elizabeth Kirk for the Director-General of Conservation dated 22 March 2019.

(b) Justin Allan Kitto on behalf of Dairy New Zealand Ltd and Fonterra Co-operative Group Ltd dated 15 March 2019.

(c) Kathryn Jane McArthur on behalf of the Royal Forest and Bird Protection Society dated 15 February 2019.

(d) Ben Farrell on behalf of the Southland Fish and Game Council and the Royal Forest and Bird Protection Society dated 17 February 2019.

(e) Darryl Sycamore on behalf of Federated Farmers of New Zealand Inc. dated 15 February 2019.

Issue 1 – Cultivation in the Alpine Physiographic Zone

5 This is primarily in response to the evidence of Linda Elizabeth Kirk for the Director-General of Conservation dated 22 March 2019, and particularly paragraphs 41 – 48. Ms Kirk discusses the issue of the activity of cultivation in the Alpine Physiographic zone, and considers that “due to the characteristics of the Alpine zone and the overland flow contaminant pathway…that the activity of cultivation in this zone may be inappropriate in the majority of this zone as the effects of cultivation may

result in adverse effects in the alpine environment." I did not specifically address the characteristics of the Alpine zone in relation to the activity of cultivation in my Evidence in Chief. This rebuttal relates only to the technical scientific nature of the evidence of Ms Kirk.

6 The Alpine Physiographic Zone is defined as all land above 800m. This is defined as a specific unit due to a unique set of characteristics listed below:

(a) steep topography;

(b) high recharge flux and dilution potential due to high precipitation rates and the dilute chemical composition of this precipitation;

(c) coarse weathered colluvium and slope debris with limited soil accumulation overlying slowly permeable, unreactive bedrock;

(d) low reduction potential in the soil zone reflecting the high degree of atmospheric connection, short substrate water retention times, and low organic carbon associated with limited vegetation accumulation;

(e) rapid water discharge via overland flow to the surface drainage network.

7 The boundary condition of this zone was set as any land greater than 800 m in elevation. This was based on the results of hydrochemical testing and physical observations of the landscape that match the above defining characteristics.

Soil and sediment loss

8 Sediment erosion generally increases with increases in slope steepness and length due to increases in velocity and volume of surface runoff (Morgan, 2005). Sediment mobilisation on hillslope is greatly influenced by a number of factors, listed below:

(a) rainfall volume and intensity;

(b) runoff generation;

(c) erodibility of the land surface;

(d) slope steepness and length;

(e) vegetation cover.

9 Vegetation cover protects against soil erosion and sediment loss in multiple ways, the key mechanisms are described below.

(a) By providing a protective layer between soil and rainfall. The vegetation intercepts a portion of the raindrops, and absorbs some of the energy of raindrops, running water and wind.

(b) The root systems of plants increase the mechanical strength of the soil and reduce the erodibility (Morgan, 2005).

Cultivation

10 Cultivation via tillage impacts significantly on two of the key factors controlling soil and sediment loss, these are vegetation cover and erodibility. Cultivation loosens the soil as well as contributing to a net downslope movement of soil. By loosening and reducing the mechanical shear strength of the soil (force by which the soil particles are bound) you decrease the threshold at which movement of that soil particle will occur, this increases soil erodibility (Morgan 2005). Cultivation by tillage inverts the upper soil layer burying vegetation and exposing bare soil. This removes any protecting effect the vegetation had and increases the erodibility by reducing the mechanical strength of the soil (previously provided by root systems). The combination of the above factors acts to increase erosion and sediment loss from cultivated land (via mechanical tillage).

Cultivation in the Alpine Physiographic Zone

11 Many physical characteristics of the Alpine zone relate to the key factors controlling soil and sediment loss described above. The zone exhibits high rainfall volumes, low vegetation cover, long steep slopes, and overland flow (runoff) as the key contaminant pathway (Hughes et al., 2016). This would indicate that risk of soil erosion and sediment loss is relatively high in this zone. Cultivation within this zone is likely to exacerbate this risk further.

12 Other important aspects to consider are the high biodiversity values and ecosystem services that the Alpine Physiographic Zone provides. Because of the large volumes of dilute precipitation and low land use intensity, the zone is the source of large volumes of recharge water that provide a dilution service to downstream environments (Hughes et al., 2016).

13 Land use activities that negatively alter the key controlling factors of sediment loss described above act to increase the sediment loss risk on any piece of land regardless of altitude. Risk is dependent on the specific characteristics of the landscape and the activity. The Physiographic Zones were not specifically designed to identify areas of high sediment loss risk from specific land use activities. However, at a broader scale the Alpine Physiographic Zone provides one method of defining land areas that have an inherently high sediment loss risk, and where increased sediment loss may have consequences for downstream environments.

Issue 2 – Groundwater lag times

14 This is primarily in response to the evidence of Justin Allan Kitto on behalf of Dairy New Zealand Ltd and Fonterra Co-operative Group Ltd dated 15 March 2019, particularly paragraph 4.16. This rebuttal relates only to the technical scientific nature of the evidence.

15 I consider that the statement of Mr Kitto in paragraph 4.16 of "*Groundwater lag times are estimated to be around ten years for most of Southland (Rodway, 2019 and references therein);"* is a misappropriation of my Evidence in Chief which states "*groundwater within unconfined aquifers with hydraulic connection to surface waters is generally young, with an average residence time or age of less than 10 years*" (the reference for this is Daughney et al., 2015).

16 Further to this, in considering the timescale at which the effects of improved practice and reduced rates of intensification may have been realised in a waterbody, the location specific lag time should be considered rather than a regional average.

Issue 3 – The statement that a Physiographic Zone approach does not address the over-riding influence of the variants on water quality risk.

17 This is primarily in response to the evidence of Ms Kathryn McArthur and Mr Ben Farrell dated 15 and 17 February respectively. This rebuttal relates only to the technical scientific nature of the evidence.

18 Ms McArthur states that "Controls are needed for all land affected by overland flow (o) and artificial drainage (a) variants, and all land contributing to degrading water quality in estuaries and lagoons as a minimum. A Physiographic zone approach does not address the over-

riding influence of the variants on water quality risk". Mr Farrell supports this view within his evidence [paragraph 139].

19 It is important to consider that Table 4 presented in of my Evidence in Chief [paragraph 93] is a binary classification of either high or low risk and does not account for the ability to mitigate those risks.

20 The risk classification I present in my Evidence in Chief [paragraph 113] takes into account not only the inherent water quality risk of dairy farming and intensive winter grazing but the potential mitigations available to reduce that risk. Utilising this approach highlights zones with deep drainage (including bypass flow); lateral drainage; and artificial drainage contaminant pathways as the posing highest potential risk to water quality.

Issue 4 – High risk land use activities

21 This is primarily in response to the evidence of Mr Darryl Sycamore on behalf of Federated Farmers of New Zealand Inc. dated 15 February 2019 and 15 March 2019. Particularly paragraphs 43 – 46 and 168 – 174 respectively. Mr Sycamore considers that "isolating only dairy farming and intensive winter grazing as part of a directive policy to the exclusion of all other activities is not good resource management practice. Other activities such as mining, forestry, or additional urban development could result in adverse effects to freshwater over the life of the pSWLP". My rebuttal relates only to the technical scientific nature of the evidence.

22 The contaminant losses (particularly nutrient losses) from dairy farming and intensive winter grazing are disproportionate to the area which they occupy in Southland. These activities (combined) make a large contribution to the overall nitrogen and phosphorus loss in the region (estimated to be ~60% and ~70% respectively).

23 Nutrient and sediment losses are of particular concern to water quality in Southland due to the potential eutrophic effects. In addition to this, dairy farming and intensive winter grazing are activities that are sources of all major contaminants (nitrogen, phosphorus, sediment and microbial pathogens).

24 There are other land use activities that can have high contaminant losses. For example: forestry (primarily sediment during harvest only);

mining (primarily sediment); horticulture (nutrients and sediment); hill country development (primarily sediment). In fact almost any activity can result in high contaminant losses if the land use is particularly intensive or there is poor management. The reason the above activities were not identified is that they are not as prevalent or spatially widespread and distributed, or their contribution to regional nutrient contaminant loads is not as large [paragraphs 107 – 110 of my Evidence in Chief dated 14 December 2018].

25 My Evidence in Chief was not intended to be an assessment of the risk posed by every activity but to identify those activities that currently pose the most risk within the Southland agricultural landscape.

26 Industrial and urban point source inputs make up a relatively small portion of the regional contaminant nutrient loads (Palliser & Elliot 2013; Snelder et al., 2014). These were not considered in the analysis presented in my Evidence in Chief as this was considered outside the scope of the topic relating to agricultural land use risk within different Physiographic zones.

References

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Snelder, T., Fraser, C., Hodson, R., Ward, N., Rissmann, C., & Hicks, A., (2014). Regional Scale Stratification of Southland's Water Quality–

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DATED this 27th day of May 2019

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Ewen Rodway