

**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)

(Continued next page)

**STATEMENT OF EVIDENCE OF DR ROSS MONAGHAN ON BEHALF OF
SOUTHLAND REGIONAL COUNCIL**

23 May 2023

Judicial Officer: Judge Borthwick

Respondent's Solicitor
PO Box 4341 CHRISTCHURCH 8140
DX WX11179
Tel +64 3 379 7622
Fax +64 379 2467

WYNN WILLIAMS

Solicitor: P A C Maw
(philip.maw@wynnwilliams.co.nz)

WILKINS FARMING CO
(ENV-2018-CHC-30)

**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
(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, qualifications and experience

- 1 My name is Dr Ross Martin Monaghan. My qualifications and experience are set out at paragraph [4] of my Statement of Evidence dated 11 February 2022.
- 2 I have been asked by the Southland Regional Council (**Council**) to prepare evidence for these proceedings, in response to the Court's Minute dated 28 April 2023 and Directions dated 9 May 2023.

Code of conduct

- 3 I confirm that I have read the Code of Conduct for expert witnesses as contained in the Environment Court Practice Note 2023. I have complied with the Code of Conduct when preparing my written statement of evidence, and will do so when I give oral evidence.
- 4 The data, information, facts, and assumptions I have considered in forming my opinions are set out in my evidence. The reasons for the opinions expressed are also set out in my evidence.
- 5 Other than where I state 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

- 6 As noted above, I have been asked by the Council to provide evidence in response to the Court's Minute dated 28 April 2023 and Directions dated 9 May 2023.
- 7 I set out below the relevant extracts from the Court's Minute and Directions, and my answers to the questions asked.

Clause 13(g)

- 8 The Court made the following comments in respect of clause 13(g) of Appendix N in its Minute dated 28 April 2023:

Clause 13(g)

[29] The term 'armouring' was used in evidence by planning and technical witnesses. We are advised farmers and farm systems advisors may be unfamiliar with this term.

[30] That being the case a new term or phrase is required to convey the idea of the residual root system and vegetative cover provided by pasture retained on the paddock.

9 Having considered the Court's comments, this clause could be reworded so that the 'armouring' phrase is not used, as follows:

(ii) *if a post-grazing residual is intended, explain how the amount of exposed soil will be minimised and the residual root system and/or vegetative cover ~~armouring provided by the pasture on the paddock~~ will be retained.*

10 The above change is intended to use terminology that is familiar to as many farmers and farm system advisors as possible. Although the concept of soil "armour" is recognised as one of at least four key principles that contribute to Soil Health¹ and is a term that is familiar to many in the regenerative farming community, it would seem to be less familiar to those in New Zealand's more conventional farming community. The term was initially suggested to convey how "armour" can (i) help to hold the soil in place (soil "cohesion") to protect from water and/or wind erosion and (ii) provide a degree of soil strength that will help minimise treading damage caused by animal hooves. The terms 'residual root system' and 'vegetative cover' are instead suggested as characteristics that are better understood by farmers and will likely implicitly achieve the same effect as was intended by "armouring".

Clauses 7(b) and (8)(c)(i)

11 The Court made the following comments in respect of these clauses in both the Minute dated 28 April 2023 and the Directions dated 9 May 2023:

Directions dated 9 May 2023:

1. *Without limiting any question that counsel may wish to put to participants on the sense check, expert evidence is required in relation to cl 7(b) and cl 8(c)(i) and the court anticipates Dr Monaghan may be in a position to respond the same.*

¹ Minimising soil disturbance, achieving plant diversity and maintaining a plant/root system are three other key principles that are recognised to contribute to Soil Health.

Minute dated 28 April 2023:

[6] In relation to cl 7(b) we wonder whether ‘predominant’ rather than ‘dominant’ may be a better fit. We would appreciate technical evidence on the granularity of information needed to inform the FEMP and whether this is captured in the suggested edits; e.g. are there circumstances in which soil types other than the predominant type could be relevant and should be recorded?

...

[8] We understand the variables in cl 8(c)(i) – crop area/yield, crop rotation length, type of crops grown, stocking rate or stock type – are inputs into a nutrient budget or nutrient loss risk assessment tool. Parties are to say if this is not the case.

Clause 7(b)

- 12 In my experience, the term “dominant” is more commonly used in soil science literature and mapping material. Such usage typically refers to the greater areal extent of a particular soil compared to other soil types that may be present but occupy proportionately smaller areas of the mapped unit (sometimes referred to as a soil “association” or “landform unit”). Notwithstanding this, for the purposes of FEMPs I would tend to instead favour the term “predominant” as its meaning also implies a consideration of “exerting marked influence” on a particular condition or outcome. This could be a useful linguistic prompt for guiding farm plans to consider the soil types that deserve the closest attention. For example, surface pathways of P, sediment and faecal micro-organism transport often occur on poorly drained soil types located in low-lying positions in the landscape. Whilst these areas may often represent a relatively small proportion of the farmed area (and thus soil map), they can contribute a disproportionately large amount of farm-scale contaminant losses.

Clause 8(c)(i)

- 13 The variables in clause [8](c)(i) appear to be suitable inputs into a nutrient budgeting tool. I therefore assume that they are also appropriate for use in a nutrient loss risk assessment tool albeit I am unfamiliar with any such tool (or tools) that exists.

Clause 13(i)

- 14 The Court made the following comments in respect of clause 13(i) of Appendix N in its Minute dated 28 April 2023:

Clause 13(i) and Notes (a), (b) and (c)

...

[33] To that end the farm systems advisors (who have not participated in the sense check) having conferred with the planning witnesses are to propose a range of scenarios for the sense checkers to test the relationship where land area, total planned feed and stocking density is changing.

[34] For example, if the area for intensive winter grazing is reduced from 15% to 10% of the landholding, can total planned feed over the next 12 months support an increase in stock density under 13(i) and FEMP generally? Our understanding is that total planned feed may support an increase in stock density grazing on the reduced area of land. If this were to occur this may result in an increase in contaminants (N and *E.coli* at least).

- 15 In conjunction with Mr McCallum-Clark, we have proposed three scenarios for the Appendix N sense-checkers to test:
- (a) A property reduces its intensive winter grazing area but maintains the same overall stock numbers (therefore increasing stocking intensity on the smaller area) by changing crop types from kale at 12-18 T DM/ha yield to fodder beet at 25 T DM/ha yield. Supplementary feed is provided to stock as required to achieve a nutritionally balanced diet.
 - (b) A property reduces its intensive winter grazing area but maintains the same overall stock numbers (therefore increasing stocking intensity on the smaller area) by increasing the amount of supplementary feed provided to ensure the stock are adequately fed. The crop type and yield remain the same.
 - (c) A property reduces its intensive winter grazing area but maintains the same overall stock numbers (NOT increasing stocking intensity on the smaller area) by wintering some livestock on pasture with supplementary feed provided to the pastured stock to ensure they

are adequately fed. This scenario will require some assumptions about the area of winter pasture needed and the ratio of pasture to supplement in the diet of animals wintered in this manner; it is likely that a greater total area of winter grazing (crop plus pasture areas) will be required than in scenario (a) above.

16 The above scenarios are suggested as three plausible outdoor wintering options that could be considered if there was a requirement to reduce the area of intensive winter forage cropland whilst ensuring stock numbers did not change.

17 In addition to the scenarios discussed above, the Court also queried the effectiveness of clause 13(i), and the Court's comments are set out below:

Directions dated 9 May 2023:

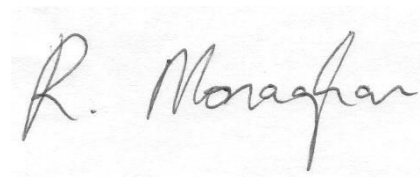
2. *Responding to counsel's query regarding the effectiveness of cl 13(i), the court anticipates evidence will be required from witnesses having expertise in soil and agricultural sciences and possibly water quality. This evidence is in addition to that to be given by the farm systems advisors.*

Minute dated 28 April 2023:

[32] The court is particularly interested in the experts' views on the likely effectiveness of cl 13(i) and the above Notes as a method to implement the outcomes of Policy 16 i.e. there is no increase in contaminants and contaminants are minimised. As explained in the fifth interim decision our intention was that the FEMP is responsive to the relationship between contaminant losses and total feed, area and stocking density.

18 In my opinion, the requirements of clause 13 will not lead to an increase in contaminant losses to water but should instead actually reduce losses. These considerations are supported by a scientific literature that documents the impacts and mitigation of animal wintering activities. An important component required for implementing and then assessing the measures in clause 13 will be the availability and use of assessment tools that can quantitatively (or at least semi-quantitatively) evaluate contaminant loss risk at paddock, block and farm scales. Whilst nutrient budgeting tools are available and in use for assessing the effects of planning decisions on N and P loss risks, the tools available for assessing the risks of sediment and faecal microorganism loss are cumbersome and little used.

- 19 In relation to clause 13(i) specifically, from my understanding, the physiographic zones provide information about the pathways of water movement through Southland's landscapes and the potential sensitivities of receiving waters to changing land use pressures. This information would therefore help to prioritise farm management decisions so that focus is placed on actions that target (i) the water quality issue of greatest concern (e.g. reducing nitrogen enrichment of groundwater versus reducing sedimentation of streams and rivers) and (ii) the transport pathway that is most active/of concern (overland flow versus deep drainage to groundwater). In general, managing and reducing nitrogen losses from farms requires consideration of farm intensity attributes (stock numbers, feed and fertiliser inputs, wintering methods) whereas managing and mitigating sediment, phosphorus and faecal contaminants requires an additional focus on the location of farming activities (topography, soil types and proximity to a water body).
- 20 In relation to clause 13(i)(3), I am unsure how this could be answered or explained without some sort of catchment-scale analysis of specific farms within specific catchments.



Ross Martin Monaghan
23 May 2023