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

UNDER	of 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 LIMITED (ENV-2018-CHC-27)
	HORTICULTURE NEW ZEALAND (ENV-2018-CHC-28)
	ARATIATIA LIVESTOCK LIMITED (ENV-2018-CHC-29)

SUMMARY OF EVIDENCE OF DAWN ELLEN DALLEY FOR DAIRYNZ LTD AND FONTERRA COOPERATIVE GROUP LTD

4 February 2022

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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)

STONY CREEK STATION LIMITED

(ENV-2018-CHC-42)

THE TERRACES LIMITED

(ENV-2018-CHC-43)

CAMBELL'S BLOCK LIMTED

(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 NGĀI TAHU, HOKONUI RUNAKA, WAIHOPAI RUNAKA, TE RUNANGA O AWARUA & TE RUNANGA O ORAKA APARIMA

(ENV-2018-CHC-47)

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

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Executive summary

1. Based on my experience and knowledge of dairy farm systems, changing the definition of intensive winter grazing (**IWG**) to 'Grazing of stock at any time between 1 May and 30 September of the same year inclusive on fodder crops or pasture to the extent that the grazing results in the exposure of soil and / or pugging of the soil' as proposed in the evidence of Ben Farrell[1] for Regional Southland Fish and Game Council (**Fish and Game**) will have a significant impact on the operation of dairy farms across the Southland region for variable reduction in nutrient and sediment loss to water.

2. Such a change in definition would capture the rotational grazing of lactating cows on pasture in late lactation (May) and early lactation (July, August, September) resulting in most, if not all, dairy farms in Southland being unable to meet the 10% of land area or 50 ha permitted activity condition for their pasture grazing activities during this period and therefore require a resource consent.

3. Defining a permitted activity based on exposure of bare soil and/or pugging would be problematic from an auditing perspective as assessment of both metrics is subjective due to the absence of robust measurement methods. Pugging depth limitations were initially proposed for IWG in the Resource Management (National Environmental Standards for Freshwater) Regulations 2020 (**NES-F**) however, because methods currently do not exist to robustly define and measure pugging, reference to pugging depth has subsequently been removed from the proposed IWG requirements in the NES-F.

4. A range of factors influence the potential environmental risks associated with grazing cows on pasture from May to September including:

    - Class of livestock
    - Area allocation per cow per day – linked to pre-graze pasture mass, post grazing residual, total dry matter intake and proportion of the diet as pasture
    - Soil type
    - Winter rainfall

[1] Statement of evidence of Ben Farrell, dated 20 December 2021.

- Age and type of pasture

5. Given the range of factors outlined above that affect the environmental risks associated with cows grazing pasture during the IWG period, I believe it will be very difficult to agree on a definition for 'high risk winter grazing on pasture' and as such, do not support the proposed inclusion of a new rule (Rule 20B) in the proposed Southland Water and Land plan (**pSWLP**).

6. An alternative approach to changing the definition of IWG or including a new rule to cover 'high risk' winter grazing on pasture, is to utilise the risk assessment framework in the Farm Environmental Management Plan (**FEMP**) process to identify 'high risk' winter grazing on pasture and implement the necessary mitigation options to reduce the environmental impact.

7. Because of the variability in pasture-based winter grazing practices, and the range of factors influencing their environmental risk (outlined above), utilising a robust, certified and audited FEMP process means the risks can be addressed through an effects-based assessment rather than trying to develop a 'one size fits all' rule capturing many lower risk situations or negotiating agreement on a definition of 'high risk' winter grazing.

Introduction

8. My full name is Dawn Ellen Dalley. My qualifications are set out in my primary evidence dated 20 December 2021 and I do not repeat these here.

Code of Conduct

9. I have read and am familiar with the Code of Conduct for expert witnesses in the 2014 Environment Court Practice Note. Except where I state that I am relying on the specified evidence of another person, my evidence in this statement 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 which I express.

Scope

10. Within my scope of expertise, I have been asked by DairyNZ Ltd and Fonterra co-operative group Ltd (**the dairy interests**) to provide my expert comments and opinions on the relief sought, including in relation to:

a. The definition of intensive winter grazing

b. Winter grazing of stock on pasture

c. Required setbacks for intensive winter grazing.

11. As part of my evidence, I will address the questions relating to the topic of wintering on pasture from the Planning Joint Witness Statement dated 9-10 December 2021 (see paragraph [42] of my evidence).

Intensive Winter grazing: Proposed definition change

12. In my opinion, changing the definition of IWG to 'Grazing of stock at any time between 1 May and 30 September of the same year inclusive on fodder crops or pasture to the extent that the grazing results in the exposure of soil and / or pugging of the soil' as proposed in the evidence of Ben Farrell for Fish and Game[2] will have a significant impact on the operation of dairy farms across the Southland region for variable reduction in nutrient and sediment loss to water for the following farm related reasons:

The specified period (1 May to September 31) includes:

- at least 3 months (May, August and September) of a seasonal lactation cycle where lactating cows are managed on pasture often utilising strip grazing with break fencing[3];
- lactating cows through June and July on farms with winter milking;
- non lactating cows through May to September; and
- springer mobs (cows undergoing diet transition in preparation for calving).

13. The major difference between management of lactating and non-lactating (dry) cows, is the area that is allocated and thus the stocking density. Because of their higher energy requirement, lactating cows are offered more total feed, and in most situations, a higher proportion of their diet is pasture. This results in lactating cows

[2]Statement of Evidence of Ben Farrell, dated 20 December 2021.

[3] Strip grazing using break fencing is the practice used to allocate pasture to dairy cattle at times of the year when pasture is growing slower than what is required to fully feed the cows on pasture. To give pasture time to regrow before the next grazing farmers calculate what proportion of the farm can be grazed each day and the remainder of the diet is provided by supplementary feed.

being offered more square metres per cow/day and as such the risk of nutrient and sediment loss is reduced.

14. Bigger area allocations and more animals per herd for lactating cows', results in animals spending less time in individual paddocks i.e., they move around the farm faster, spending less time in paddocks adjacent to waterways, further reducing the risk of nutrient and sediment loss.

15. If the definition change applies to all classes of cattle grazing pasture during the defined period, this would require all paddocks on the farm to meet the required IWG setbacks from water bodies and to have critical source area (**CSA**) protection. To achieve this, would come at significant cost, as for many farms it would require a reconfiguration of the farm infrastructure i.e., paddocks, laneways, water troughs etc. to achieve. Mr Cain Duncan has provided a case study of the practical implications of requiring all CSA's to be excluded from grazing in paragraphs 39-45 of his evidence[4].

16. The final grazing rotation of the season (April-May) is used to set the farm up for the next lactation season. The aim is to evenly graze the pastures to ensure the best quality feed is available for the lactating cows after calving in spring. The risk of going into winter with high pasture mass in paddocks is that rain and frosts over winter will result in poor pasture quality in spring. If farmers are unable to graze the pasture in the required setback zone to meet the IWG rule proposed in the 10 December Planning JWS, this will result in the following:

    - Increased stocking density on the remainder of the grazing area from May to September

    - A proportion of most paddocks on the farm that are adjacent to waterways or have CSA's accumulating high mass, poor quality pasture in them that could not be grazed until early October. Because paddocks are grazed in rotation, for some paddocks this would mean there would be no grazing in these areas for up to 6 months (April to October). Excluding areas from grazing for this length of time would have a significant impact on pasture growth & quality for the remainder of the season and would create additional complexity with grazing management through the highest risk period for nutrient and sediment loss.

[4] Statement of Evidence of Cain Duncan, dated 4 February 2022.

17. An alternative approach to the proposed IWG definition change to manage the risks of wintering on pasture would be to utilise the FEMP approach to identify high risk practices occurring during this period that require different management. The IWG definition approach will capture many lower risk situations while utilising FEMPs would be more efficient at dealing with farm, specific, high risk areas and activities.

18. For both lactating and non-lactating cows, the lower pre-graze biomass in paddocks used for grazing cows on pasture through winter, (relative to crop paddocks e.g., 2-4 tonnes DM/ha pasture vs 8-30 tonnes DM/ha crop) necessitates larger areas to be allocated per animal per day. As a result, farm systems relying on pasture-based wintering are likely to require significantly more than 10% of the land area or 50 ha for their wintering activities.

19. Expanding the IWG definition to include all classes of cattle grazing on pasture would result in most, if not all, dairy farms in Southland being unable to meet the 10% of land area or 50 ha permitted activity condition for their grazing activities (lactating and dry cows) during this period and therefore require a resource consent.

20. Additionally, defining an activity based on exposure of bare soil is problematic for all pastoral systems because of the way pastures grow. Unlike a lawn where a high seeding rate and the absence of grazing creates a dense even sward, ryegrass pastures are established at lower seeding rates to promote clover growth and to allow the development of daughter tillers after the heading (seeding period). Perennial grasses are perennial not because individual shoots survive indefinitely, but because the plant community is dynamic, with dying tillers being replaced by new tillers.

21. Pastures are also grazed at varying frequency depending on the class of stock, time of year, and farm system, with the laxer grazing of dairy pastures resulting in fewer but larger tillers than more closely grazed sheep pastures[5].

22. As such, avoiding exposure of bare ground in a dairy grazing system at any time of the year is almost impossible, even when recommended pasture residuals of 1500-1700 kg DM/ha remain after grazing because of the gaps between plants within the sward. If the proposed IWG definition was adopted, it would likely result in most farms requiring a consent.

[5] C Matthew, A Hernandez-Garay, J Hodgson “Making sense of the link between tiller density and pasture production” (1996) Proceedings of the New Zealand Grassland Association 57; 83-87.

23. Similarly, defining an activity based on an assessment of pugging will be difficult to audit as methods currently do not exist to robustly define and measure pugging. Additionally, avoiding any pugging of the soil by livestock (depending on the definition of pugging) in pasture paddocks following a rain event in autumn, winter, or early spring when soils are at or near field capacity, even at low stocking densities is not possible.

24. Pugging depth limitations were initially proposed for IWG in the NES-F however, because methods currently do not exist to robustly define and measure pugging, reference to pugging depth has subsequently been removed from the proposed IWG requirements in the NES-F.

25. The NES-F definition of IWG specifically excludes pasture and this is the common understanding within the farming community. Definitions that differ from the NES-F will create confusion on-the-ground for farmers and certifiers and risk farmers getting overwhelmed with process. In my experience farmers are more likely to adopt good management practices when there is clarity on the environmental risks of an activity and when the benefits of the practice change are supported by robust science.

'High risk' winter grazing on pasture

26. With increasing public pressure on wintering cows on forage crops, increased costs for establishing crops, and the intricacies of wintering on crop, there has been an increase in the number of farmers utilising paddock-based wintering on pasture. Pasture based wintering is not new to the Southland region, with many farmers, predominantly in regions of lower winter rainfall or lighter free draining soils, wintering on pasture for several decades.

27. What has changed is the range of 'pasture-based' winter grazing practices that are being implemented. Winter grazing on pasture is a continuum, primarily driven by the class of livestock and the proportion of supplement in the diet.

28. There are several different situations that need to be understood, as outlined below:

Grazing in winter milking systems

29. In systems where winter milking is practiced, cows will be offered up to 18 kg DM of total feed with 60-80% of this being pasture and the remainder as supplement primarily in the dairy or on a feed pad. Pre-graze pasture mass is most likely in the range of 2500-3500 kg DM/ha grazing to a residual of 1500 kg DM/ha resulting in a

daily area allocation per cow of 50-130 m^2 depending on target pasture allocation and pre-grazing mass. Animals rotate around pastures with the expectation that the pasture will regrow behind them and there will be minimal need for regrassing.

Traditional winter grazing of non-lactating animals

30. The more traditional pasture wintering system for non-lactating cows, most commonly practiced on, but not limited to support blocks, involves a diet of approximately 50-60% pasture and 50-40% supplementary feed. In this system, autumn grown pasture is saved for feeding during winter, so cows are strip grazed in paddocks with 3000-4000 kg DM/ha, grazing to a residual of approximately 1300 kg DM/ha. Under this regime, they are offered 25-50 m^2 of paddock area per day and supplemented with either silage or baleage. Animals rotate around the farm area during the winter period, and the expectation is that the pasture will regrow behind them and minimal regrassing will be required in the spring. If regrassing is required, it will generally be in isolated areas where the pasture has not regrown.

Baleage wintering

31. In the last 2-3 years, there has been an increased adoption of intensive baleage wintering. In this system, paddocks may or may not have autumn saved pasture on them, therefore pasture contributes a much smaller proportion of the diet and there may be less vegetation protecting the soil. I explain this practice further below.

32. Baleage is laid out in the paddocks prior to winter, and supplement feeders are used to minimise supplement wastage during feeding. Area allocation is more variable but more likely to be in the range of 10-15 m^2/cow/day.

33. Cows are offered a fresh area of pasture with baleage daily and move across paddocks in a similar way to those on crops with back fencing to protect areas already grazed.

34. The condition of the pastures and soil following grazing is variable depending on soil type, winter rainfall and pasture cover during grazing.

35. On some farms, the expectation will be that the paddocks will be regrassed in the spring, whereas others may only require regrassing of isolated areas of the paddock. Remedial action will also vary from year to year based on the specific winter weather conditions.

36. It is important to note that the role and management of paddocks for intensive baleage wintering is quite different to those of a sacrifice paddock (as expanded further on below). For example, when undertaking baleage wintering, a grazing plan is developed for the paddocks use and management prior to winter, and cows move through the paddocks over time based on the feed allocation and environmental conditions.

Sacrifice paddocks

37. In contrast, a sacrifice paddock (as defined in the NES-F) is a paddock used temporarily to hold stock in such a way that the pasture is likely to be severely damaged and require pasture renovation.

    - For IWG, sacrifice paddocks are mostly used to move cows off crop paddocks when soil conditions have deteriorated to the point that they are negatively impacting on animal welfare. To prevent animal health issues, the cows will continue to graze the crop and consume most of their daily feed allocation from this area but will be moved onto the sacrifice paddock overnight to allow them to rest.

    - Sacrifice paddocks are also used to reduce pressure on pastures and soils across the rest of the farm when soils vulnerable to pugging, are wet. Cows will graze their allocated daily pasture area to the target residual and then be moved onto the sacrifice paddock to minimise pugging across large areas of the farm.

38. Because of their role in the farm system, an individual sacrifice paddock may be utilised repeatedly for short periods and on infrequent occasions, or in some years will not be required at all.

Regenerative winter grazing

39. A smaller number of farmers have also adopted self-described, but poorly defined, regenerative winter grazing practices which involve grazing animals on a range of mixed pasture swards with high pre-grazing mass, supplemented with hay that is not protected by supplement feeders during feeding. In this system, farmers aim to trample up to 30% of the pasture and supplement into the soil.

40. As a relatively new wintering option with regional specific research only having been initiated in the last 12-18 months, there is a dearth of information on the environmental, financial, and animal welfare implications of this system.

41. It is possible that these practises may have a reduced impact per hectare, but no different (or higher) per herd or farm impact compared to current best practise. This is due to larger areas potentially required for wintering using regenerative grazing.

42. It is important that regulation neither endorses nor rules out regenerative grazing, but that the emerging research results can inform farm planning and action within any regulatory framework.

Table 1 summarises the range of pasture based grazing options currently being implemented across the Southland region

	Period	Feed allocation (kg DM/cow)	Proportion of diet as pasture (%)	Pre-graze mass (kg DM/ha)	Post Graze mass (kg DM/ha)	Daily area allocation (m^2/day)	Complete regrassing required
Lactating cows	May – September	15-18	70-80	2800-3300	1500-1600	50-130	No
Traditional pasture wintering of dry cows & grazing of springer mobs	June – August	13	50-60	3000-4000	1200-1300	25-50	Unlikely
Baleage wintering with pasture cover	June – August	13	10-20	3000	0-1200	10-15	Regional, weather, soil type dependent
Baleage wintering without pasture cover	June – August	13	0	variable	0-1000	10-15	Likely
Regenerative	June – August	13	variable	Up to 4000	1600-2000	20-40	Unlikely

56. Factors influencing the environmental risks associated with grazing cows on pasture from May to September include:

- Class of livestock
- Area allocation per cow per day – linked to pre-graze pasture mass, post grazing residual, total dry matter intake and proportion of the diet as pasture
- Soil type

- Winter rainfall
- Age and type of pasture.

57. Given the range of factors outlined above that affect the environmental risks associated with cows grazing pasture from 1 May to 31 September, I believe it will be very difficult to agree on a definition for ‘high risk winter grazing on pasture’ and as such, do not support the proposed inclusion of a new rule (Rule 20B) in the plan.

58. I consider that an alternative to changing the definition of intensive winter grazing or including a new rule to cover high risk winter grazing on pasture, is to utilise the risk assessment framework in the FEMP process to identify high risk winter grazing on pasture and implement the necessary mitigation options to reduce the environmental impact.

59. Because of the variability in pasture-based winter grazing practices, and the range of factors influencing their environmental risk (outlined above), utilising a robust FEMP process means the risks can be addressed through an effects-based assessment rather than trying to develop a ‘one size fits all’ rule or negotiate agreement on a definition of ‘high risk’ winter grazing.

60. The requirement for FEMP’s to be certified and audited by registered advisors will ensure the farm specific 'high risk’ winter grazing practices are appropriately identified, and mitigations implemented to reduce contaminant losses to water, contributing to improved water quality.

61. Utilising the audited FEMP process is more likely to reduce the risk of any unintended consequences from system changes adopted to avoid existing rules where the new system results in increased environmental risk.

62. Achieving on-farm good management practice is key to mitigating environmental risks as well as maintaining and improving water quality. Implementation of a FEMP that is subject to an independent audit gives confidence that farmers are implementing or are on track to implement good management practices by their next audit. As part of the limit setting process in the Canterbury Land and Water Regional Plan, Environment Canterbury (**ECan**) started introducing audited Farm Environment Plans (**FEPs**) in 2015-16. In the 2015-16 season, there were 232 FEPs (either within irrigation schemes or as individual farms), and by the 2020-21 season this number had increased to 1096 FEPs.

63. ECan have observed a clear trend in improving performance at successive audits. As an example, an irrigation scheme report documenting their annual and cumulative FEP audit results in 2020-21, shows that while there was only 10% of farms in A Grade in 2015-16, this has steadily risen to 63% A grade by 2020-21. Correspondingly, there has been a decrease in poor performance with only 5% of farms recording a C and 1% a D grade in 2020-21[6].

64. ECan attribute the improved performance to the FEP and the FEP audit process and related sanctions, not just from having an FEP. Their data suggests that performance at the first audit after the farm has had an FEP is lower than at subsequent audits, implying it is the audit process, not just the FEP, that drives improvement.

Intensive Winter Grazing: Required setbacks

65. Grass buffers adjacent to waterways and in CSAs are used as a mitigation option for preventing sediment and suspended nutrients associated with overland flow of water, from entering waterways.

66. Grass buffer zones have two main modes of action:

    - Filtering out sediment and nutrients attached to sediment by slowing the speed of the water. This reduction in the speed of flow results in sediment and attached nutrients settling out in the buffer zone; and

    - Maintaining the integrity of the soil structure and thus the ability of water to infiltrate the soil, reducing the volume of water moving along the flow path.

67. Gharabaghi et al. 2002[7] reported that most particles are deposited within the first few metres of the filter strip, however finer sediment is harder to trap because the particles remain in suspension.

68. Research by Monaghan et al. (2017)[8] reported reductions in estimated fluxes of nitrogen, phosphorus and suspended sediment in overland flow and sub-surface drainage by 66%, 67% and 80% respectively, following the implementation of

[6]Amuri Irrigation Collective "Farm Environment Plan Auditing Results 2020-21" (20 October 2021) <LATEST-FILE-Auditing-Report-2020-21.pdf (amuriirrigation.co.nz)>.
[7] B Gharabaghi, R Rudra, HR Whiteley, WT Dickinson "Development of a Management Tool for Vegetative Filter Strips" (2002) Journal of Water Management Modeling. R208-18. DOI:10.14796/JWMM.R208-18.
[8] RM Monaghan, S Laurenson, DE Dalley, TS Orchiston "Grazing strategies for reducing contaminant losses to water from forage crop fields grazed by cattle during winter" (2017) New Zealand Journal of Agricultural Research 60(3): 333-348.

protection and strategic grazing of the CSAs (gullies) in adjacent winter crop paddocks. In this research, the CSA had been cultivated and planted in crop and was grazed using the 'last bite' principle during good grazing conditions. In my opinion, had the CSA been left in pasture and ungrazed, the reductions would likely have been greater.

69. Preparation of paddocks for winter cropping and to renew pasture, often, but not always, requires cultivation resulting in exposed soil and a greater risk of sediment loss to waterways if a high rainfall event results in overland flow of water during the crop or pasture establishment period.

70. Establishment of crops and renovation of pasture, usually occurs during late spring and summer when soil moisture levels are lower and the frequency of rainfall events resulting in overland flow is reduced. However, any time there is cultivated soil, there is risk of sediment and nutrient loss and thus an appropriate buffer should be implemented in paddocks adjacent to waterways until the crop and pasture is sufficiently established to prevent soil loss in overland flow.

71. Based on the risks associated with sediment loss from cultivated soil in instances where a high intensity rainfall event occurs before the new vegetation is established and the effectiveness of buffer strips (especially the first 1-3 metres) in removing suspended sediment, I support the Southland Regional Council's recommendation of a 5m buffer when cultivating paddocks with slopes of <10 degrees during low-risk periods for overland flow, but only when a sediment source is present.

72. The practice of IWG on crop occurs during periods of higher soil moisture (often saturated soils), during periods of increased risk of rainfall events that result in overland flow, and when soil often remains bare for several months. In my opinion, the combination of these three factors results in a period of greatest sediment loss risk. Increased frequency of events, and a larger source of sediment, increases the risk of the sediment load saturating the edge of the buffer zone and potentially reducing their efficiency in capturing nutrients from events later in the season.

73. To maximise the effectiveness of sediment and nutrient removal where a flow path discharges into a waterway, management of CSAs will be critical in reducing the rate of water flow and the subsequent sediment and nutrient loading on the buffer zones

74. In my opinion, the higher risk of water and sediment movement associated with IWG, necessitates a requirement for more rigorous mitigations during this period. As such, I

support the inclusion of a 10m waterway buffer in Rule 20A; as proposed by Environment Southland.

Dawn Dalley

4 February 2022