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)

STATEMENT OF PRIMARY EVIDENCE OF DAWN ELLEN DALLEY (FARM SYSTEMS – TOPIC B)

20 December 2021

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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

Summary of evidence

1 This evidence addresses the practical farming implications that arise from the relief sought by DairyNZ in its appeal against the proposed Southland Water and Land Plan (**pSWLP**), particularly in relation to the 120 cow limit to mob sizes included within rules 20 (farming) and 35A (feedpads/lots).

2 The relief sought by DairyNZ to rules 20 and 35A is narrow in scope and the changes proposed are set out in attachment 2 to the planning evidence of Mr Gerard Willis[1]. The changes to the provisions have been agreed by both the Farm Systems and Planning experts at the recent round of expert conferencing and subsequent Joint Witness Statements.

3 I am not aware of any scientific evidence to support the limitation of mob size to 120 cows included within rule 20(a)(iii)(3)(E). Based on this lack of technical evidence, it is my opinion that the 120-cow mob size limit should be deleted from the intensive winter grazing rule as such a limitation could result in perverse water quality outcomes.

4 With respect to rule 35A(a)(i), to the best of my knowledge, there has been no information provided by other parties, or research available that outlines any environmental risks associated with mobs of more than 120 cows on feedpads/lots. There is no evidence to suggest that such a limit will be effective in managing the effects on water quality. Accordingly, I propose that the 120-cow mob size limit be deleted from this rule. The 120 cow limit risks deterring farmers from investing in off paddock wintering due to increased costs associated with having to build more smaller structures with associated effluent infrastructure.

Introduction

5 My full name is Dawn Ellen Dalley.

6 I am a Senior Scientist in the New Systems and Competitiveness team at DairyNZ and have been employed by DairyNZ and their predecessor organisation (Dexcel Ltd) since 2003.

[1] Statement of Primary Evidence of Gerard Matthew Willis For Fonterra Cooperative Group Limited and DairyNZ Ltd (Planning – Topic B), 20 December 2021

7 I have a BAgSci (Hons 1) degree from Lincoln College (1984-1987) and a PhD in Animal Nutrition from Lincoln University (1988-1992).

8 Prior to working at DairyNZ I spent 3 years in the dairy nutrition team at the Dairying Research Corporation in Hamilton (now DairyNZ) where I continued research into mineral nutrition and rumen function.

9 In 1995 I commenced employment at the Ellinbank Dairy Research Institute, Victoria, Australia as a post-doctoral fellow in the Feedbase and Nutrition group. Two years into the role I was promoted to Team Lead of the Feedbase and Nutrition group, a role I held for six years before returning to New Zealand in 2003.

10 While in Australia I was involved in several statewide projects investigating the role of different supplements and forage crops in dairy production systems including their impact on milk quality, rumen function and animal performance.

11 In 2003 I joined Dexcel Ltd as a regional scientist managing the Whareroa Research Centre in Hawera (Taranaki, New Zealand) a role I held for 3 years. In this role I was responsible for the implementation of research projects as well as managing a team of up to 12 farm and technical staff. It was during this period that my research focus broadened from nutrition-based trials to farm systems comparisons with involvement in the Once-a-Day Milking and Jersey-Friesian Crossbred programmes of research.

12 In 2006 I moved into the South Island Regional Scientist role for Dexcel and was promoted to Senior Scientist in 2015. Since 2008 I have been involved in many farm systems and participatory research programmes with farmers in Southland. Projects of note include: 1) the Southland pasture monitoring project from 2007-2011; 2) Southern Wintering systems from 2010-2013; 3) Pastoral21 Telford Farm systems project to identify future farm system with reduced environmental footprint from 2012-2015; 4) Southern Dairy Hub Farm systems comparison from 2018-current and 5) Participatory Research project 2019-current

In addition, I led two research aims in the National Forages for Reduced Nitrate leaching (FRNL) programme, was a lead researcher in the Canterbury Future Farm systems project and am currently involved in the Plantain Potency programme.

13 I have strong practical and technical farming knowledge and have been providing quality information founded on science to farmers in the South Island for well over a decade.

14 My current research interests include profitable and sustainable dairy farm systems; improved crop-based wintering; animal health and welfare and alternative wintering options for southern dairy farmers.

15 I led the four-year Southern Wintering Systems initiative for DairyNZ that partnered with dairy farmers in Southland and the three-year Pastoral 21 Future Farm Systems research in Otago and Southland.

16 Currently I lead the farm systems and fodder beet feeding research at the Southern Dairy Hub (**SDH**), the SDH Participatory Research project focusing water quality, greenhouse gas emissions and farm profitability and the SDH workstream of the Thriving Southland funded Hedgehope-Makarewa Catchment group winter crop establishment demonstration.

Code of Conduct

17 I have read and am familiar with the Code of Conduct for expert witnesses in the 2014 Environment Court Practice Note. My qualifications as an expert are set out above. 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

18 I have been asked to provide expert farm systems evidence on the practical farming implications that arise from the relief sought by DairyNZ in its appeal against the pSWLP particularly in relation to the 120 cow limit to mob sizes included within rules 20 (farming) and 35A (feedpads/lots).

19 I have also been asked to produce evidence for DairyNZ and Fonterra (collectively the **Dairy Interests**) in relation to matters/issues within appeals filed by other parties in which they have an interest. I will prepare a second brief of evidence to address these matters in early 2022.

20 The relief sought by DairyNZ to rules 20 and 35A is narrow in scope and the changes to the provisions have been agreed by both the Farm Systems and Planning experts at the recent round of expert conferencing and subsequent Joint Witness Statements.

The 120 cow limit on mob size for IWG (Rule 20(a)(iii)(3)(E)

21 The daily area allocation to animals on crop is determined by the crop yield (i.e. the kilograms of dry matter (DM) per square metre) and the proportion of crop in the total diet (i.e. the kilograms of dry matter offered per cow per day; Table 1) therefore stocking density within the daily area allocation is not driven by the number of cows in the mob but rather the amount and type of crop being offered. The number of days required to graze a paddock is dictated by the area of the paddock, the yield of the crop, the daily crop allocation and the size of the mob (Table 1).

Table 1: Effect of crop yield and daily crop allocation on the area offered/cow/day and days to graze based on different mob sizes offered 10 kg DM/cow/day

Crop yield	kg DM/m^2	Area offered/cow/day for 10 kg DM crop allocation	Area offered/cow/day for a 13 kg DM crop allocation	Days to graze 3 ha with 120 cows offered 10 kg DM/day	Days to graze 3 ha with 200 cows offered 10 kg DM/day
10 T DM/ha	1.0	10.0	13.0	25	15
15 T DM/ha	1.5	6.7	8.7	38	23
20 T DM/ha	2.0	5.0	6.5	50	30
25 T DM/ha	2.5	4.0	5.2	63	38

22 To accommodate all the cows on a farm, it is my opinion that limiting mob size to 120 cows will result in more individual areas under winter grazing management at any given time, potentially increasing the environmental risk through more complicated wintering plans and less flexibility to implement adverse weather plans. With cows simultaneously grazing in more areas around the farm there is increased likelihood of having mobs of animals in paddocks adjacent to

waterways or in paddocks with critical source areas that require management to reduce the environmental risk.

23 Using the **SDH** as an example, the environmental implications of such a rule are outlined in the scenario below. The **SDH** farm has a range of soil types, topography (upper terrace and lower river flats) and a waterway through the centre and along the eastern boundary generating multiple risks to plan for and manage.

24 740 cows are wintered on crop on the **SDH** farm. To conduct research that is relevant to farms across the region half the cows are wintered on kale and half on fodder beet. Under the proposed 120 cow limit this would result in the herd being split into 8 mobs for wintering, hence needing eight separate paddocks (Figure 1). Because paddocks on the lower terrace (blue shaded paddocks labelled 1 in Figure 1) have heavier soils they are grazed at the start of winter before they get too wet and if it does get wet the cows can be moved to paddocks on the upper terrace until the conditions are more favourable for grazing. To achieve this objective with 120 cow mobs (Figure 1) four of the eight mobs of animals would be grazing paddocks adjacent to waterways (pink shaded area) for between 25 and 63 days depending on the crop type and yield in the individual paddocks. With this scenario there is also only one wet weather contingency paddock for each mob on the upper terrace (green shaded paddocks labelled 2 in Figure 1).

25 At a larger mob size of 200 the cows would be grazing four paddocks simultaneously (Figure 2; blue shaded paddocks labelled 1) and it would take 15-30 days to graze individual paddocks. Under this scenario there is more flexibility in the timing of grazing for the higher risk paddocks adjacent to the waterways, they graze through the paddocks quicker and there are more wet weather contingency paddocks for each herd (green, yellow and teal shaded paddocks in Figure 2).

Figure 1: Grazing plan 120 cow mobs

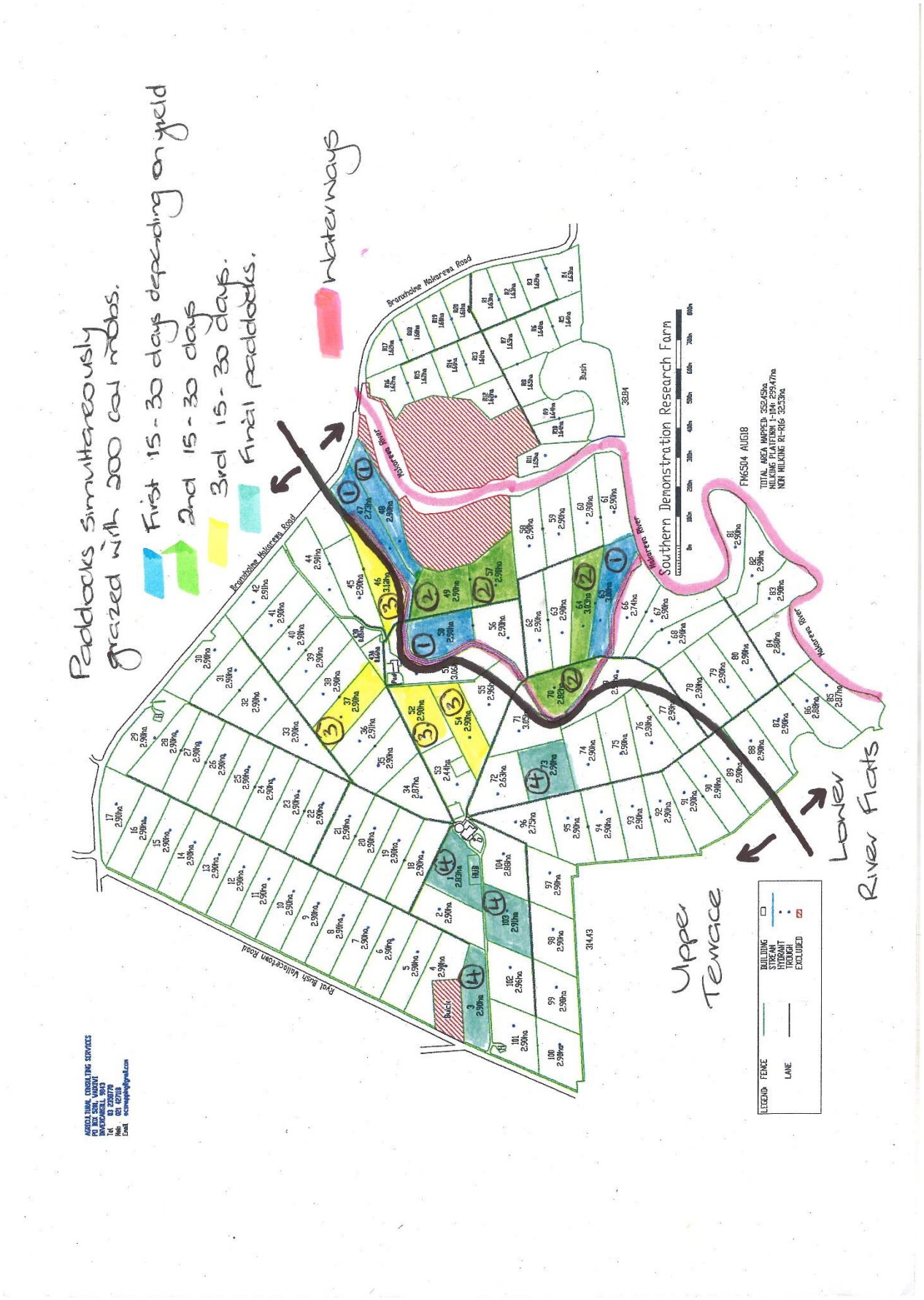

Figure 2: Grazing plan 200 cow mobs

26 With multiple paddocks with smaller mobs being grazed at any one time it will take longer for the mobs to completely graze individual paddocks e.g., for a crop yielding 15 tonne of dry matter per hectare, 120 cows being offered 10 kg DM/day of crop would take 38 days to graze 3 ha whereas 200 cows would graze the same paddock in 23 days (Table 1). The longer grazing period reduces the opportunity for the establishment of a catch crop to capture nutrients remaining after grazing and reduce the period of exposed soil between crops and pasture. Research conducted by Plant and Food Research has concluded that the earlier a catch crop is planted the more soil nitrogen is taken up by the plants and therefore leaching risks are reduced (Malcolm et al. 2018[2]).

27 At SDH grazing eight paddocks simultaneously would increase the complexity to plan and implement adverse weather plans for animal welfare and environmental protection as there would be fewer lower risk paddocks available in other parts of the farm to move animals into during adverse weather events (Figures 1 and 2). Combining mobs during such events will change herd dynamics and increase the risk of poor animal welfare outcomes. To accelerate practice change farm systems' implementation needs to be simple and reliable. Increased complexity will increase the risk of system failure.

28 I am not aware of any scientific evidence to support the limitation included within rule 20(a)(iii)(3)(E). I also note that no expert witness who participated in the Farm Systems expert conferencing disagreed with me that the 120 cow mob limit should be deleted from the rule.

Feedlots/Feedpads/sacrifice paddocks (Rule 35A):

29 If feedpads/lots must be constructed with a sealed and impermeable base and liquid animal effluent and storm water captured[3], in my opinion it is unnecessary to limit the number of animals able to be accommodated to 120 per feedpad/lot. There has been no information provided by other parties, nor is there any research available that outlines the environmental risks associated with mobs of more than 120 cows on feedpads/lots.

30 Limiting individual feedpads/lots to 120 cows will increase the cost of investment in infrastructure as farmers will be forced into building multiple smaller structures

[2] Malcolm, Carey, Teixeira, Johnstone, Maley, de Ruiter 2018. Potential of catch crops to reduce nitrogen leaching in New Zealand winter grazing systems. Journal of New Zealand Grasslands 80:207-214.
[3] Rule 35A(iv)(1) pSWLP

to accommodate their herd, each potentially with its own effluent capture and management. In some catchments or soil types adoption of off-paddock wintering e.g. feedlots/pads could contribute to better environmental and animal welfare outcomes. Increased costs will deter some farmers from investing in infrastructure and more complex effluent management increases the risk of failure[4], both of which reduce the opportunity to decrease the environmental risk of wintering.

31 Well planned and managed feedpads/lots can be an effective and important mitigation to reduce environmental losses, especially during autumn and winter when the risk of soil pugging (Beukes et al. 2013[5]) and contaminant loss (Beukes et al. 2017[3]) is higher. Rules that unnecessarily make the planning and implementation of feedpads/lots more difficult and expensive to implement will discourage farmers from investing in this mitigation option.

32 The inclusion of sacrifice paddocks in Rule 35A with wintering pads, stand-off pads, loafing pads and self-feed silage storage facilities, provides similar issues to those outlined above and highlights the concerns relating to mob limits; especially as no definition of a sacrifice paddock has been included in the plan.

33 In my opinion, sacrifice paddocks serve a different purpose within a dairy farm system to off-paddock infrastructure like the pads outlined above. Off paddock infrastructure is designed for accommodating animals for up to 24 hours per day for extended periods of time while sacrifice paddocks are often used to provide an alternative area to hold animals during periods of adverse weather so may only be utilised for short periods on infrequent occasions.

34 Sacrifice paddocks are used to reduce soil damage on large areas of the farm and minimise environmental and animal welfare risks associated with adverse

[5] Beukes, Romera, Clark, Dalley, Hedley, Horne 2013. Evaluating the benefits of standing cows off pasture to avoid soil pugging damage in two dairy farming regions of New Zealand. New Zealand Journal of Agricultural Science 56 (3): https://doi.org/10.1080/00288233.2013.822002

[3] Beukes, Romera, Gregorini, Macdonald, Glassey, Shepherd 2017. The performance of an efficient dairy system using a combination of nitrogen leaching mitigation strategies in a variable climate. Science of the Total Environment 599-600: 1791-1801.

weather events. The proposed restrictions to mob size will make planning and implementing adverse weather plans more complicated.

Conclusions

35 For the reasons outlined above, it is my opinion that there is insufficient justification for the mob size limits proposed for IWG.

36 Similarly, feedlots/pads and sacrifice paddocks should be treated separately in the planning process.

37 I support the amendments to rules 20 and 35A in relation to the matters identified above as set out in the Planning JWS.

Dawn Dalley

20 December 2021