

Your reference: App-20171209  
18 August 2017

The General Manager  
Environment Southland  
Private Bag 90116  
INVERCARGILL

Attention: Ms E Allan

Dear Emily

**Re: Potential public notification of South Dairy Ltd application - APP-20171302**

In our recent conversation you advised me that the South Dairy application will be publicly notified primarily because the Overseer modelling estimates that the total losses to the environment will increase by 315kg N each year under the details of the proposal.

While this is true, we believe that you have not taken into account the mitigation that has been proposed – to winter off the 599 cows for 84 days. Our calculations suggest that this will remove much more than the 315kg N each year, more than offsetting the expanded cow numbers.

This information was provided in the application in appendix 8 (also attached). The estimate of 3% attenuation (Houlbrooke & Monaghan, 2009) has been discussed and cited in previous correspondence. Our workings are summarised below:

Change in land use	Urinary N (kg/year)	Attenuated loss <sup>1</sup>	Notes
Remove stock from new block	-16,140 (decrease)	-484.2kg	Remove calves, heifers, and wintered cows
Expanded cow numbers	21,725 (increase)	651.75kg	Add 150 dairy cows, and 200 cows wintered for 23 days
Mitigation (Cows wintered off)	-22,038 (decrease)	-661.14kg	599 cows wintered off original platform
<b>Total</b>	<b>16,453 (decrease)</b>	<b>493.59kg</b>	

Because the overseer modelling did not include the mitigation, the 661kg N has not been taken into account, and this significant mitigation should be considered when making a decision on this application.

Please can you re-consider this, and we look forward to hearing your response.

<sup>1</sup> Houlbrooke, D. J., and Monaghan, R. M., 2009. *The influence of soil drainage characteristics on contaminant leakage risk associated with the land application of farm dairy effluent*. Prepared for Environment Southland by AgResearch, Invermay, Dunedin.

Yours faithfully  
Civil Tech Ltd

Murray Gardyne  
Director

## Appendix 8 Scale of effects of urinary N from Heifers, Calves and Cows

The scale of effects, particularly urinary N from the heifers, calves and cows is estimated below. The amount of estimated urinary N per calf and hectare of 90g N per day has been based on the meta analysis that follows. It is considered conservative given the current research is limited to measurements for heifers aged 6-11 months in age and 150-200kg in weight. It is expected the urinary N per heifer will be higher than this value, particularly as they approach full live weight of 400-500kg.

### Current scenario

	Urinary N (g / day / head)	Number	Days	total N (kg/day)	total N / year (kg)
Calves	90	170	365	15.3	5,585
Heifers	90	140	365	12.6	4,599
Cows (wintered 68d)	438	200	68	87.6	5,957
<b>Totals</b>				27.9	16,140

### Proposed scenario

	Urinary N (g / day / head)	Number	Days	total N (kg/day)	total N / year (kg)
Dairy cows (150 for 300 days)	438	150	300	65.7	19,710
Wintered cows (200 for 23 days)	438	200	23	87.6	2,015
<b>Totals</b>				65.7	21,725

### Mitigations

	Urinary N (g / day / head)	Number	Days	total N (kg/day)	total N / year (kg)
Dairy cows (wintered off)	438	599	84	262.362	22,038

## Meta-analysis of heifer and calf total urinary N loss

Only a handful of studies have been undertaken that measure or estimate the urinary concentration, volume and total N loss of immature dairy cows to land. The following literature review has been undertaken to support the estimation of total urinary N loss on the South Dairy farm, and includes the recent published research projects undertaken on farms in New Zealand.

The range of measured and estimated N loss for a calves was from 42-106 g per heifer per day, for samples that ranged in age from 6-11 months, and average weights between 144 and 210kg.

No research on N loss has been located for heifers between the ages 12 to 24 months.

Study	Heifer age (months)	Weight (kg)	Urinary N loss (g / day)
Edwards (2014)	6	144	42
Judson & Edwards (2016)	8	180	106*
Cheng et al (2015)	9-10	210	70
Cheng et al (2016)	9-11	184	99
Carr (2015)	8-9	176	

\* calculated based on a measured on an average urine concentration of 0.53%.

### References

Carr, H. (2015). *Live weight gain and urinary nitrogen excretion of dairy heifers grazing pasture, chicory and plantain* (Doctoral dissertation, Lincoln University).

Cheng, L., McCormick, J., Hussein, A. N., Fraslin, C., Moonsan, Y., Logan, C., Grabot J. & Edwards, G. R. (2015). Urinary nitrogen excretion, grazing and urination behaviour of dairy heifers grazing pasture, chicory and plantain in autumn. In *Proceedings of New Zealand Society of Animal Production* (Vol. 75, pp. 70-73).

Cheng L., McCormick J., Logan C., Hague H., Hodge M. C., Edwards G. R. (2016) Liveweight gain and urinary nitrogen excretion of dairy heifers grazing perennial ryegrass-white clover pasture, canola, and wheat. *Animal Production Science*.

EDWARDS, G. (2014). Liveweight gain and urinary nitrogen excretion of dairy heifers grazing perennial ryegrass/white clover pasture, wheat and canola. In *Proceedings of the 5th Australasian Dairy Science Symposium* (p. 309).

JUDSON, H., & EDWARDS, G. (2016). Urinary nitrogen concentration from dairy heifers grazing kale supplemented with either plantain or perennial ryegrass baleage in winter. *Journal of New Zealand Grasslands*, 78, 99-102.