BEFORE HEARING COMMISSIONERS at CHRISTCHURCH

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of the proposed Variation 5 to the Proposed Canterbury Land and Water Regional Plan – Nutrient Management and Waitaki
BETWEEN	DairyNZ Limited
AND	Canterbury Regional Council

STATEMENT OF PRIMARY EVIDENCE OF DR GLEN ANDREW TREWEEK FOR DAIRYNZ LIMITED

22 July 2016

Corporate Office: Private Bag 3221,
Hamilton 3240

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1. EXECUTIVE SUMMARY

1.1 This evidence summarises the outcome of analysis undertaken on behalf of DairyNZ aimed at preparing a catchment nitrogen load loss below the root zone for the Northern Fan catchment in the Lower Waitaki.

1.2 My conclusions are:

- There are large differences in estimated farm and catchment nitrogen leaching losses, depending on what version of OVERSEER is used, and how irrigation practices and soil parameters are modelled;

- Dairy farms make up about 50% of the Northern Fan area, and contribute an estimated 80-95% of the root zone nitrogen load (depending on what version of OVERSEER is used to calculate the nitrogen load);

- If all farms implemented GMP, the catchment nitrogen load would likely decrease by an estimated 20-40% below the current nitrogen load;

- In my opinion, substantial reductions to root zone nitrogen losses will be made when farmers implement GMP. These reductions in nitrogen losses will decrease the catchment nitrogen load from the current catchment root zone nitrogen load. If the aim of the Waikakahi catchment is to maintain root zone nitrogen losses at the current level, then the reductions that will be made when all farmers implement GMP will provide the necessary headroom for low emitters to intensify without the need for high-intensity farms to decrease their nitrogen losses below GMP.

2. INTRODUCTION

2.1 My full name is Dr Glen Andrew Treweek. I am a soil scientist with Aqualinc Research Ltd (Aqualinc).

2.2 I hold a Bachelor of Science in Earth Science, a Masters of Science (Hons) in Earth Science from the University of Waikato and a PhD from Lincoln University.

2.3 I have over eight years' experience in nitrogen cycling and nitrogen losses from farming systems in New Zealand. I have been involved in assessing catchment scale nitrogen loss loads on the Hinds Plains, and the Amuri Basin.

2.4 I regularly work with irrigation schemes in Canterbury on Farm Environment Plan GIS mapping. I also work with individual farmers to prepare Farm Environment Plans (FEPs) and prepare OVERSEER nutrient budgets. I have experience as a FEP Auditor, where I assess individual farmer's performance against the industry agreed Good Management Practice (GMP) targets.

2.5 I hold a certificate of Advanced Nutrient Management from Massey University, and have tutored undergraduate students at Lincoln University on the use of OVERSEER.

Background

2.6 My involvement in Environment Canterbury's (ECan) Plan Change 5 to the Canterbury Land and Water Regional Plan commenced in June 2016. My involvement included the preparation of a catchment nitrogen load loss below the root zone for the Northern Fan catchment in the Lower Waitaki area for DairyNZ. I have read the following technical reports which have helped me in this process:

- Shaw, H., Palmer, K. 2015. Waitaki Limit Setting Process: Technical Overview. Environment Canterbury Technical Report No. R15/99, and

- Mojsilovic et al. 2015. Generation of nitrogen and phosphorus loss estimates in the Waitaki Catchment. Environment Canterbury Technical Report No. R15/99.

Code of Conduct

2.7 I have read the Environment Court's Code of Conduct for Expert Witnesses contained in the Environment Court's Practice Note 2014, and I agree to comply with it. In that regard, I confirm that this evidence is within my area of expertise except where I state that I am relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

3. SCOPE OF EVIDENCE

3.1 My evidence will deal with the following:

(a) Calculation of a catchment scale nitrogen loss load below the root zone for the Northern Fan, Waitaki; and

(b) Assessment of the effect that the implementation of Good Management Practice (GMP) on all farms within the Northern Fan catchment has on the nitrogen load below the root zone.

4. CALCULATING CURRENT CATCHMENT NITROGEN LOAD

4.1 I adopted the same methodological approach as ECan in calculating a root zone nitrogen load for the Northern Fan. This method uses GIS spatial analysis of land use type, irrigation type, climate, and soil type, together with a look up table of nitrogen loss values. I took nitrogen loss numbers from Mojsilovic (2015), which were derived using OVERSEER v 6.1.3.

4.2 The majority of irrigated farms on the Northern Fan receive water from the Morgen Glenavy Ikawai Irrigation Company Ltd (MGI). MGI provided land use and irrigation information for the Northern Fan farms they supply.

4.3 Using current land use data and recent irrigated area mapping, I was able to closely approximate the catchment nitrogen loss with that reported in in the Plan (+/- 3%) (Table 1).

Table 1: Comparison of calculated catchment N load between ECan (PC5) and this analysis (Treweek) using Mojsilovic look up table N losses for the Northern Fan. Values in parenthesis represent percentage change from Mojsilovic (2015).

Catchment	**ECan analysis (Mojsilovic 2015) t N yr^{-1}**	**ECan Updated (Treweek 2016) t N yr^{-1}**
Greater Waikakahi	240	238 (-<1%)
Whitney's Creek	190	180 (-5%)
Northern Fan	430	418 (-3%)

4.4 The small differences in calculated nitrogen losses between Mojsilovic (2015) and my works are due to small changes in land use and irrigation type on some farms, together with slight differences in soil categories. In addition, I did not account for the nitrogen loss associated with Oceania Dairy Company, which would bring my analysis closer to Mojsilovic (2015).

4.5 Dairy farms were responsible for approximately 80% of the calculated 418 t N yr^{-1} catchment nitrogen load. The 80% proportion of catchment nitrogen from dairying was similar in both the Greater Waikakahi and Whitney's Creek sub-catchments. The remaining 20% of nitrogen loss was dominated by extensive sheep farming in the Greater Waikakahi, and by irrigated sheep/beef farming in Whitney's Creek (Appendix A).

4.6 Irrigated area and system type had recently been mapped using a combination of FEP mapping, aerial images, and satellite imagery (Brown, 2016). The irrigated area mapping by Brown (2016) that I used the most up-to-date and accurate account of irrigated area on the Northern Fan. Irrigation system type by area was predominantly K-line sprinkler in the Greater Waikakahi, and borderdyke in Whitney's Creek (Appendix B). About 60% of the Greater Waikakahi was not irrigated (dryland), whereas only about 15% of Whitney's Creek was dryland. These dryland areas included non-productive areas such as roads and urban areas. More efficient centre pivot irrigators accounted for only about 20% of irrigation on the Northern Fan.

4.7 I used soil categories based on those reported in Lilburne (2013, 2015). The categories are derived from the soil profile available water to 60 cm (PAW_{60}), and the soil drainage characteristics (Appendix C). I digitised the ECan/Lilburn soil map of the Lower Waitaki from Mojsilovic (2015), where I found that using the ECan/Lilburn soil categories, about 50% of the Northern Fan had light or very light soils. The soils in Whitney's Creek sub-catchment are generally lighter than those in the Greater Waikakahi, where there is a larger proportion of hill country.

4.8 The ECan/Lilburn soil categories were intended to cover the majority of the Canterbury Plains, and therefore do not specifically consider the soils on the Northern Fan. I found 28 S-Map soil siblings on the Northern Fan, and five of these S-Map siblings accounted for more than 70% of the area covered by dairying. To refine the nitrogen loss lookup table to accommodate the dominant S-Map siblings on the Northern Fan, I redefined the soil categories slightly Table 2).

4.9 The re-definition of soil categories had the effect of increasing the proportional area covered by soils termed 'extremely light' (PAW_{60} <50 mm). The areas where no S-Map data existed were primarily hill country under extensive dryland sheep farming. I assigned these areas the H (heavy) category to simulate the low leaching potential of hill soils.

Table 2: Dominant S-Map siblings for dairy farm land on the Northern Fan, with revised soil category.

S-Map sibling	PAW_{60}	Revised soil category	Area	
			(ha)	% of dairy
Darn_7a.2	45	**XL**	3,497	32.9%
Stew_1a.1	63	**VL**	1,843	17.3%
Kaur_2a.1	87	**L**	1,537	14.4
Waip_1a.1	93	**M**	803	7.5%
Kaia_1a.1	144	**H/D/Pd**	348	3.3%
Other Siblings	-	-	2,611	24.6%

4.10 Re-calculating the current catchment nitrogen load (as calculated by Mojsilovic 2015) with the revised soil categories had the effect of increasing the catchment load by 17% from that reported in Table 1.

4.11 By revising the soil categories, the calculated nitrogen loss showed a greater increase in Whitney's Creek where there is higher proportion of dairy on light soils (Table 3).

Table 3: Comparison in calculated catchment N load when re-classifying Northern Fan soil categories. Values in parenthesis represent percentage change from Mojsilovic (2015).

Catchment	ECan analysis (Mojsilovic 2015) t N yr^{-1}	ECan updated (Treweek 2016) t N yr^{-1}	ECan revised soil (Treweek 2016) t N yr^{-1}
Greater Waikakahi	240	238 (-<1%)	268 (+12%)
Whitney's Creek	190	180 (-5%)	236 (+24%)
Northern Fan	430	418 (-3%)	504 (+17%)

5. ACCOUNTING FOR OVERSEER VERSION CHANGES

5.1 The nitrogen loss numbers presented in Mojsilovic (2015) were generated using OVERSEER version 6.1.3. OVERSEER v 6.1.3 is no longer available, which resulted in me using the most recent version of OVERSEER (6.2.2 current at time of writing) for further modelling work to assess the effects of GMP.

5.2 Changes to OVERSEER in version 6.2.0 significantly changed the way in which soil and irrigation parameters could be entered into the model. Mojsilovic (2015) acknowledged the substantial change OVERSEER v 6.2.0 had on nitrogen leaching loss estimates, and they estimated that in their analysis the nitrogen loss from dairy farms with borderdyke irrigation "*could be underestimated as much as a factor of 2 to 3*" (p 36). These underestimates of nitrogen leaching have significant consequences for catchment nitrogen loss calculations, especially for the Northern Fan where borderdyke accounts for about one third of all irrigation.

5.3 DairyNZ used data from three actual Lower Waitaki dairy farms and prepared nutrient budgets for them using OVERSEER v 6.2.2. The details of this modelling is provided in the evidence of Mr Mark Neal. Of the three farms, each was irrigated by one of the three main irrigation types on the Northern Fan – K-line sprinklers, borderdyke, or centre pivot. I asked DairyNZ to model the three farms with each of the five dominant S-Map siblings (Table 2) and with standardised irrigation inputs (Appendix D). I used the nitrogen loss results from these 15 OVERSEER runs (three farms across five soils) to re-populate the irrigated dairy fields in the Mojsilovic (2015) look up table, and re-calculated the catchment nitrogen load (Appendix E). For non-dairy farms and dryland areas of dairy farms, I used nitrogen loss values from Mojsilovic (2015). Using the non-dairy and dryland values from (2015) only has a minor impact on catchment nitrogen load, because irrigated dairy farms are responsible for more than 75% of the calculated catchment nitrogen load. Using the nitrogen loss values from DairyNZ's OVERSEER files, the catchment nitrogen load increased from that calculated by Mojsilovic (2015) by a factor of three (Table 4).

5.4 This three-fold increase in my calculated catchment nitrogen loss is not un-expected, and is consistent with that predicted by Mojsilovic (2015). The primary reason for the increase was the change in OVERSEER model inputs between versions 6.1.3 and 6.2.2.

5.5 In my view, the large changes in estimated nitrogen loss than can occur between OVERSEER version changes, highlights the challenges of including fixed numbers for calculated nitrogen losses in Regional Plans, unless the method for assessing compliance is also fixed in the Plan.

Table 4: Comparison in calculated catchment nitrogen load when re-classifying Northern Fan soil categories and using OVERSEER data from three actual Lower Waitaki dairy farms. Values in parenthesis represent percentage change from Mojsilovic (2015).

Calculation method	**ECan analysis (Mojsilovic 2015)**	**ECan updated (Treweek 2016)**	**ECan revised soil (Treweek 2016)**	**DairyNZ Current (Treweek 2016)**
Catchment	$t\ N\ yr^{-1}$			
Greater Waikakahi	240	238 (-<1%)	268 (+12%)	725 (+202%)
Whitney's Creek	190	180 (-5%)	236 (+24%)	551 (+190%)
Northern Fan	430	418 (-3%)	504 (+17%)	1,276 (+197%)

6 ASSESSING THE EFFECT OF IMPLEMENTING GMP ON NITROGEN LOSS

6.1 ECan is seeking to achieve a specific catchment nitrogen load equal to current farming practices for the Greater Waikakahi sub-catchment, and equal to current practice +8% for the Whitney's Creek sub-catchment.

6.2 Higher intensity farms in the Greater Waikakahi are asked to reduce nitrogen losses by 10% below GMP losses, with the resulting 10% allocated to low emitters in the catchment to allow them to intensify to some degree.

6.3 DairyNZ asked that I estimate the effects on the catchment nitrogen load below the root zone if all dairy farms implemented the industry agreed GMP. To do this, DairyNZ uploaded the 15 OVERSEER files used to calculate the current catchment nitrogen load to

ECan's MGM Portal. The MGM Portal allows farmers to assess their performance against the GMP targets by making changes to the OVERSEER files that they upload. The MGM Portal then produces a nitrogen loss estimate for that farm as if it were operating at GMP. The MGM Portal made changes to the 15 OVERSEER files that DairyNZ uploaded, and re-calculated the nitrogen loss for each farm. I used these nitrogen loss values to re-populate the dairy fields in the Mojsilovic (2015) look up table, and re-calculated the catchment nitrogen load.

6.4 Using the results from the MGM Portal, I calculated a reduction in nitrogen loss of 43% from the Greater Waikakahi and 26% Whitney's Creek sub-catchments, to give a total Northern Fan nitrogen load reduction of 36% by dairy farmers moving from current practise to GMP.

Table 5: Comparison between Current Northern Fan nitrogen load using OVERSEER files from real dairy farms, and nitrogen load produced by ECan's MGM portal. The Mojsilovic (2015) look-up table was supplemented with dairy nitrogen loss values from DairyNZ. Values in parenthesis represent percentage change from calculated Current catchment nitrogen load.

Calculation method	DairyNZ Current	Current MGM Portal
Catchment	$t\ N\ yr^{-1}$	
Greater Waikakahi	725	413 (-43%)
Whitney's Creek	551	405 (-26%)
Northern Fan	1,276	818 (-36%)

6.5 The MGM Portal have a strong focus on irrigation efficiency. These improvements in irrigation efficiency will reduce soil drainage volumes. In my view, it is these reductions in drainage volumes that will be primarily responsible for the reductions in nitrogen leaching that will occur when farmers implement GMP.

6.6 If the MGM portal is retained as currently proposed, I estimate the actual reduction in nitrogen load on the Northern Fan will be in the vicinity of 20-40%. This range aligns with the range of reductions I have calculated in Table 5. There are always uncertainties when conducting catchment nitrogen load calculations. For the Northern Fan, the key uncertainties are; the irrigation inputs used in OVERSEER; variation in actual individual farm management practices, and; how close the Northern Fan farms currently are to achieving the GMP targets.

6.7 I was unable to model the likely N loss reductions from the alternative irrigation proxy proposed by Mr Andrew Curtis and Mr Ian McIndoe and the alternative N fertiliser proxy proposed by Dr Stewart Ledgard and Dr Bruce Thorrold as these proxies were not able to be provided to me in sufficient time to be incorporated into my calculation.

Modelling Limitations

6.8 The calculated catchment nitrogen loads for the Northern Fan do not take into account any other gains or losses that may occur if OVERSEER v 6.2.2 was used to re-calculate nitrogen losses from non-dairy farms. I expect that if OVERSEER v 6.2.2 was used to model non-dairy farms on the Northern Fan, then the calculated catchment nitrogen loads would be even higher than what I have presented here.

6.9 At the time I conducted this analysis, the current live version of OVERSEER was v 6.2.2, but the MGM portal had not been updated and was still running OVERSEER v 6.2.1. I do not expect that updating the MGM portal to OVERSEER v 6.2.2 would materially alter my calculations, as the changes in v 6.2.2 have largely been around data input screens and internal model feed allocation.

7. CONCLUSIONS

7.1 In my opinion, the reductions to nitrogen leaching that are estimated to occur when farmers implement GMP have been underestimated during the planning process. My analysis shows that if the hearing panel retains the MGM Portal as proposed, and if existing dairy farms implemented GMP, then the calculated Northern Fan nitrogen load could decrease by 20-40%.

7.2 In my opinion, substantial reductions to root zone nitrogen losses will be made when farms implement GMP. These reductions in nitrogen losses will decrease the catchment nitrogen load from the current catchment root zone nitrogen load. If the aim for the Northern Fan catchment is to maintain the current nitrogen loss for the entire catchment, but provide some headroom for less intense farms, then the reductions that will be made when all farmers implement GMP will provide the necessary headroom for low emitters to intensify, without the need for high-intensity farms to decrease their nitrogen losses below GMP.

Dr Glen Treweek
22 July 2016

REFERENCES

Brown, P. 2016. Canterbury detailed irrigated area mapping. Report No. C16010/1. Prepared for Environment Canterbury by Aqualinc Research Limited.

Lilburne, L. Webb, T. Robson, M. and Watkins, N. 2013. 'Estimating Nitrate-Nitrogen Leaching Rates under Rural Land Uses in Canterbury (updated).' Technical Report R14/19. Environment Canterbury.

Lilburne L, Webb T 2015. Soil and climates in Canterbury: clusters for the Matrix for Good Management project. Unpublished Landcare Research Contract Report LC 2378 for Environment Canterbury.

Mojsilovic, O., Duff, K., Shaw, H., Palmer, K., Steel, K. 2015. Generation of nitrogen and phosphorous loss estimates in the Waitaki Catchment. Environment Canterbury Technical Report. R15/109.

Appendix A

Calculated root zone nitrogen load by land use type for the Northern Fan and sub-catchments using Mojsilovic (2015) look up table nitrogen loss values.

N loss by land use (T N/yr)	Greater Waikakahi		Whitney's Creek		Northern Fan	
Dairy	194	81.7%	144	80.1%	339	81.0%
Cattle	6	2.7%	13	7.0%	19	4.6%
Lifestyle	0	0.0%	0	0.3%	1	0.1%
Low N loss (roads, urban etc.)	1	0.2%	0	0.2%	1	0.2%
Mixed cropping	4	1.6%	-	-	4	0.9%
Sheep	21	8.9%	0	0.2%	21	5.1%
Sheep & beef	12	4.9%	22	12.2%	34	8.1%
Total	**238**	100.0%	**180**	100.0%	**418**	100.0%

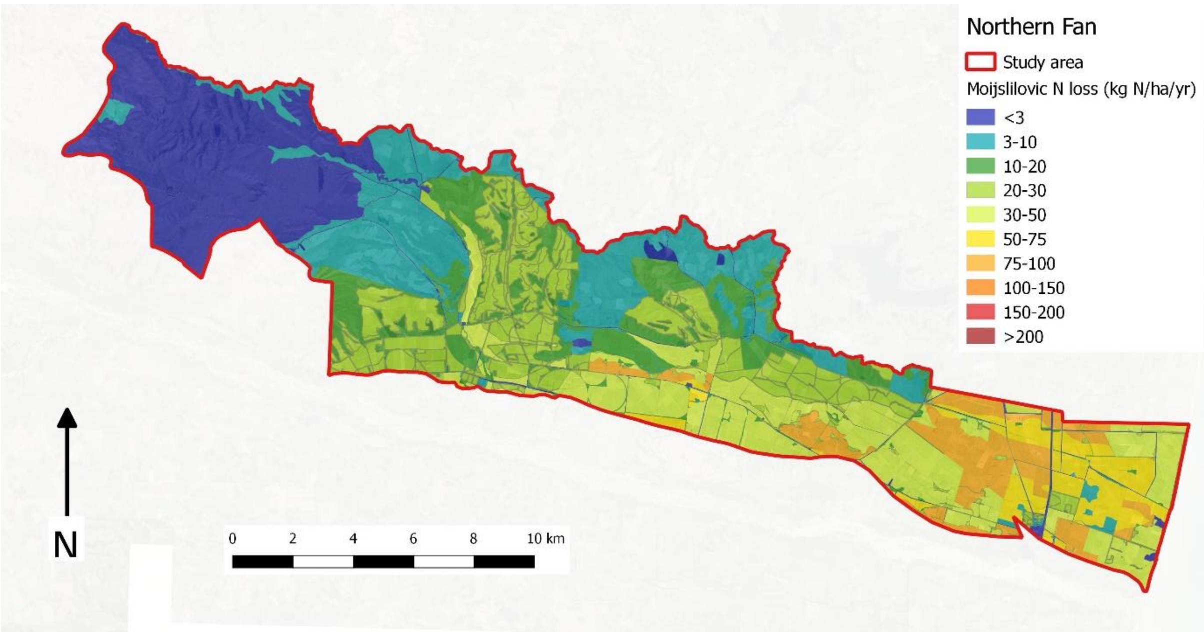

Figure 1: Calculated catchment nitrogen loss using OVERSEER v6.1.3 nitrogen loss values from Mojsilovic (2015).

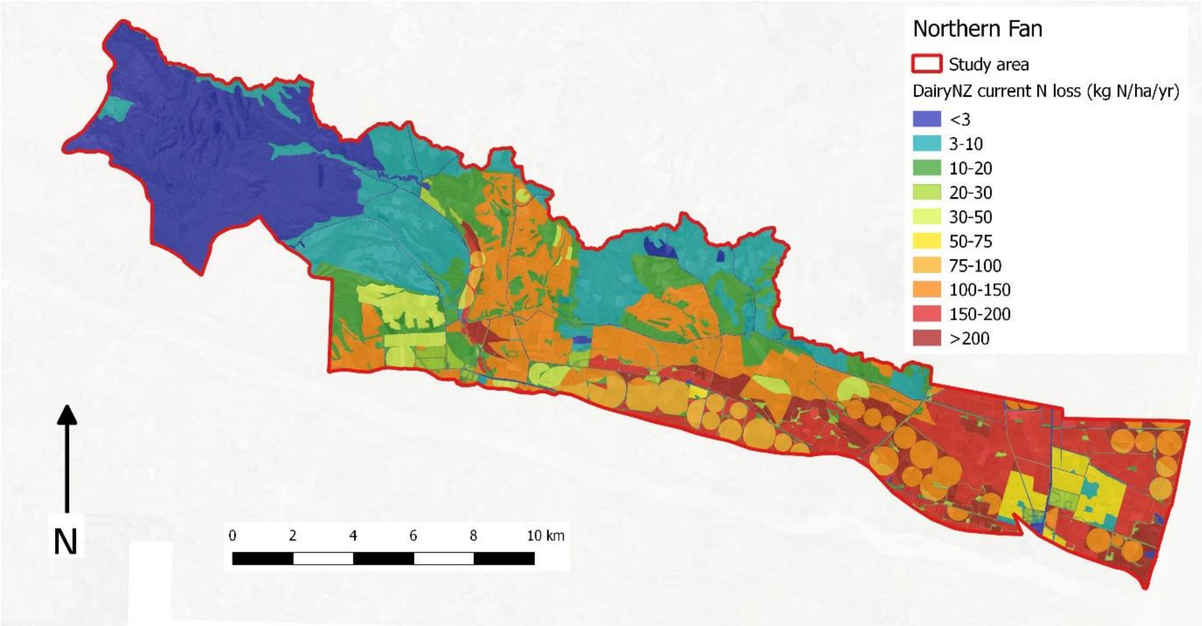

Figure 2: Calculated catchment nitrogen load using nitrogen loss values from DairyNZ's OVERSEER (v6.2.2) modelling based on actual Lower Waitaki dairy farms.

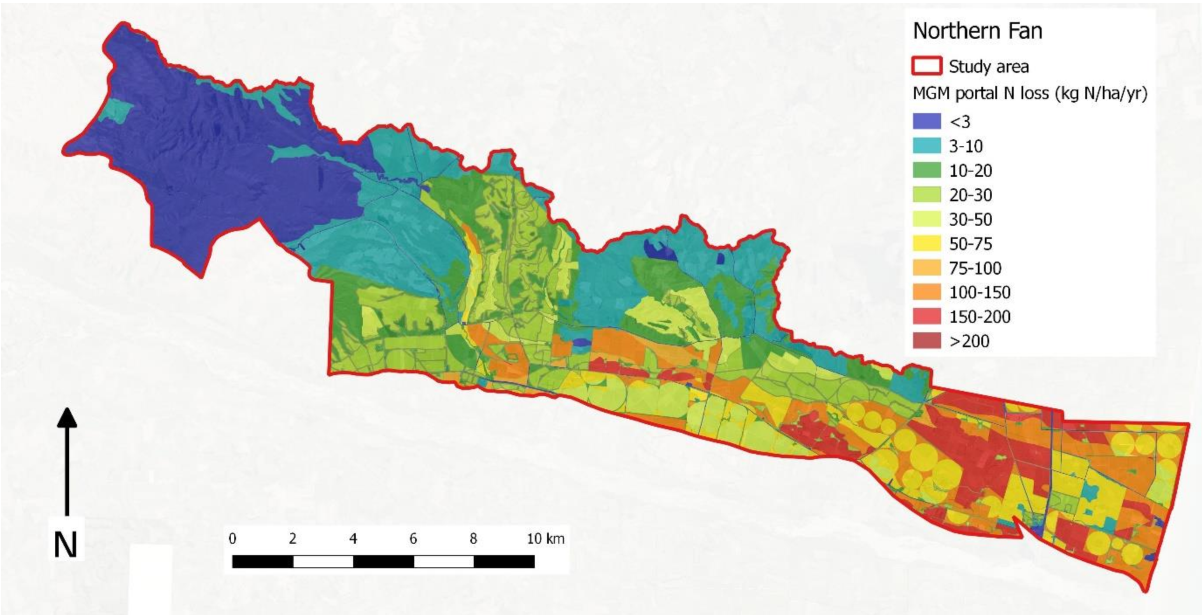

Figure 3: Calculated catchment nitrogen load using nitrogen loss values from ECan's MGM Portal.

Appendix B

Irrigated area by system type on the Northern Fan during early 2016.

	Greater Waikakahi		Whitney's Creek Zone		Northern Fan	
Irrigation type	ha	%	ha	%	ha	%
K-line/sprinkler	3,098	50%	825	20.9%	3,924	38.7%
Borderdyke	1,139	18.4%	2,128	53.9%	3,267	32.2%
Pivot	1,332	21.5%	785	19.9%	2,117	20.9%
Roto-rainer	121	2%	174	4.4%	295	2.9%
Fixed sprinkler	274	4.4%	-	0.0%	274	2.7%
Gun	112	1.8%	19	0.5%	130	1.3%
Lateral	87	1.4%	-	0.0%	87	0.9%
Unknown	37	0.6%	19	0.5%	56	0.5%
Total Irrigated	6,200	100%	3,950	100%	10,149	100%

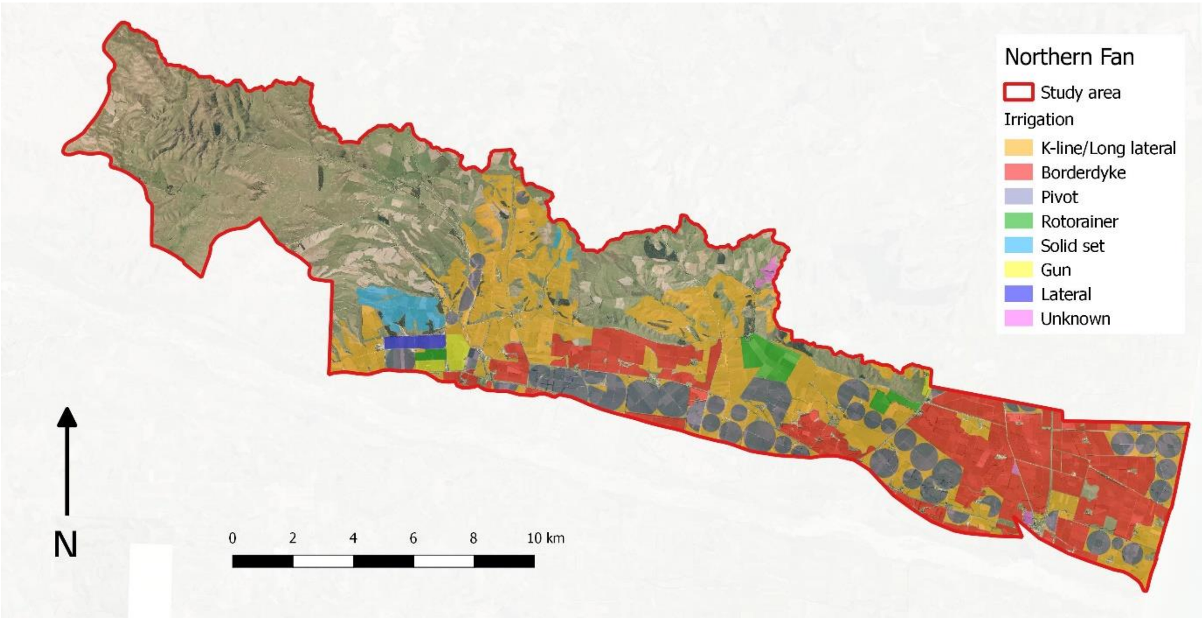

Figure 4: Irrigated area by system type on the Northern Fan, early 2016.

Appendix C

Northern Fan Lilburn/ECan soil categories.

ECan Soil	PAW_{60} (mm)	Greater Waikakahi		Whitney's Creek Zone		Northern Fan	
		ha	%	ha	%	ha	%
XL	**<50**	192	1.2%	0	0.0%	192	1.0%
VL	**50-80**	2,931	18.8%	3,758	81.0%	6,689	33.0%
L	**80-110**	2,829	18.1%	383	8.3%	3,212	15.9%
M	**110-150**	4,675	30.0%	499	10.7%	5,174	25.6%
H	**>150**	587	3.8%	0	0.0%	587	2.9%
Pd	**>150**	314	2.0%	0	0.0%	314	1.5%
No S-Map	**n/a**	4,072	26.1%	0	0.0%	4,072	20.1%

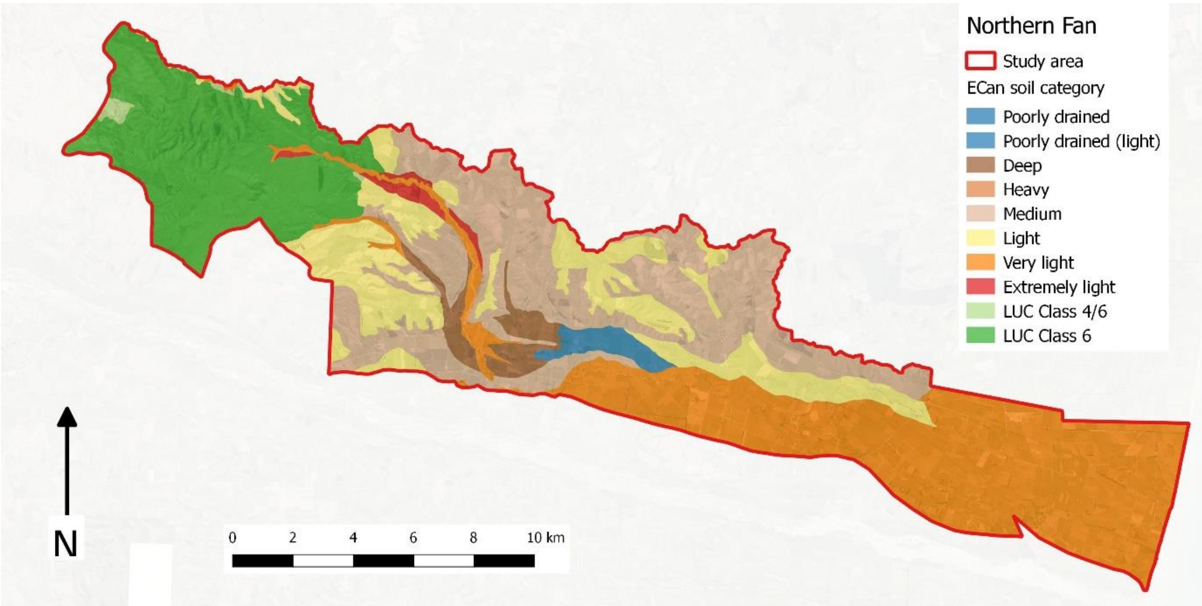

Figure 5: Digitised ECan/Lilburn soil categories from Mojsilovic (2015).

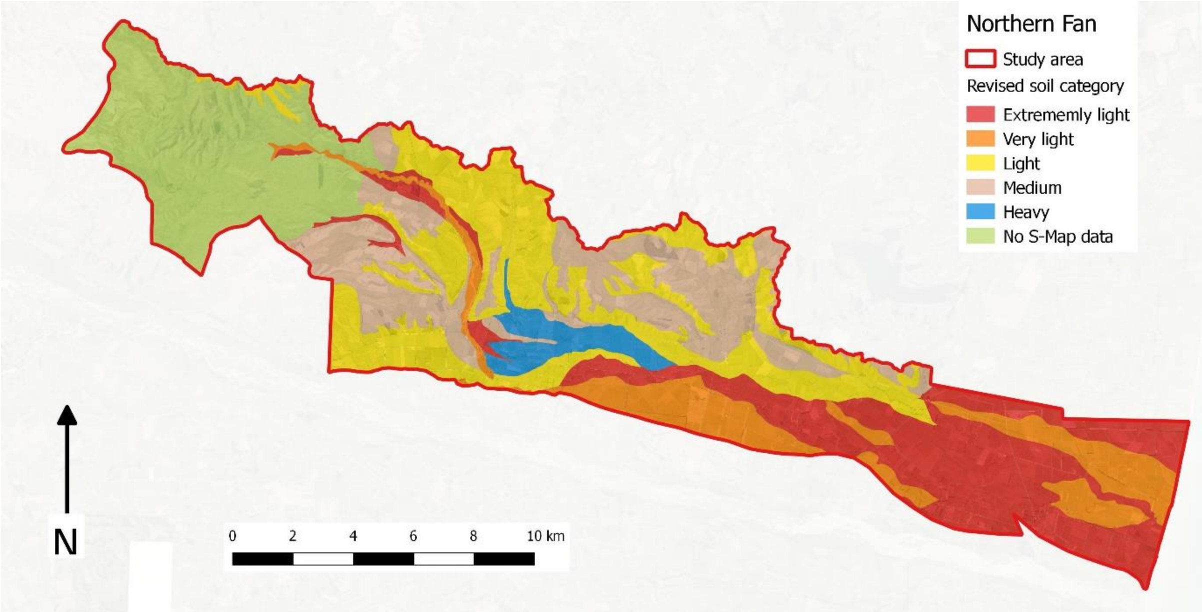

Figure 6: Revised soil categories based on profile available water of Northern Fan S-Map siblings.

Appendix D

Standardised Irrigation inputs

The OVERSEER irrigation settings were adjusted slightly for consistency and to better reflect the potential practices of MGI/Northern Fan farmers. Irrigation settings for each farm were set as follows:

- Borderdyke – 105 mm every 17 days (MGI scheme capacity), 10 irrigation events per year, 1,050 mm yr^{-1} applied.
- K-lines – 60 mm every 14 days, 14 irrigation events per season, 840 mm yr^{-1} applied. Actual water use for K-line irrigated farms could be closer to 700 mm yr^{-1}, but actual on-farm water use data was not available for verification.
- Pivot – 13 mm every 3 days, approximately 500 mm yr^{-1} applied.

Appendix E

Nitrogen loss lookup table based on Mojsilovic (2015), with additional nitrogen loss values for Dairy Farms from DairyNZ.

Land use category	Irrigation type	Soil category	N loss (kg ha^{-1} yr^{-1})		
			Mojsilovic (2015)	DNZ Current	MGM Portal
Dairy	Dryland	XL	25.1	25.1	25.1
Dairy	Dryland	VL	19.8	19.8	19.8
Dairy	Dryland	L	14.9	14.9	14.9
Dairy	Dryland	M	13.2	13.2	13.2
Dairy	Dryland	H	11.4	11.4	11.4
Dairy	Dryland	PdL	7.4	7.4	7.4
Dairy	Dryland	Pd	5.7	5.7	5.7
Dairy	Dryland	LUC Class 4-6	5.7	5.7	5.7
Dairy	Dryland	LUC Class 6	3	3	3
Dairy	Dryland	LUC Class 7	1.5	1.5	1.5
Dairy	K-line	XL	46.8	222	118
Dairy	K-line	VL	36.6	187	63
Dairy	K-line	L	27	102	28
Dairy	K-line	M	24.1	126	34
Dairy	K-line	H	21	135	30
Dairy	K-line	PdL	13.5	135	30
Dairy	K-line	Pd	10.5	135	30
Dairy	K-line	LUC Class 4-6	27	135	30
Dairy	K-line	LUC Class 6	3	135	30
Dairy	K-line	LUC Class 7	1.5	135	30
Dairy	Pivot	XL	46.8	108	60

Dairy	Pivot	VL	36.6	81	45
Dairy	Pivot	L	27	32	27
Dairy	Pivot	M	24.1	46	30
Dairy	Pivot	H	21	41	19
Dairy	Pivot	PdL	13.5	41	19
Dairy	Pivot	Pd	10.5	41	19
Dairy	Pivot	LUC Class 4-6	27	41	19
Dairy	Pivot	LUC Class 6	3	41	19
Dairy	Pivot	LUC Class 7	1.5	41	19
Dairy	Borderdyke	XL	93.1	180	162
Dairy	Borderdyke	VL	51.4	160	143
Dairy	Borderdyke	L	35.4	108	87
Dairy	Borderdyke	M	31.4	128	109
Dairy	Borderdyke	H	27.1	128	118
Dairy	Borderdyke	PdL	17.7	128	118
Dairy	Borderdyke	Pd	13.5	128	118
Dairy	Borderdyke	LUC Class 4-6	35.4	128	118
Dairy	Borderdyke	LUC Class 6	3	128	118
Dairy	Borderdyke	LUC Class 7	1.5	128	118
Dairy Support	Dryland	XL	24.7	24.7	24.7
Dairy Support	Dryland	VL	17.6	17.6	17.6
Dairy Support	Dryland	L	11.7	11.7	11.7
Dairy Support	Dryland	M	9.5	9.5	9.5
Dairy Support	Dryland	H	7.6	7.6	7.6
Dairy Support	Dryland	PdL	5.8	5.8	5.8
Dairy Support	Dryland	Pd	3.8	3.8	3.8

Dairy Support	Dryland	LUC Class 4-6	5.7	5.7	5.7
Dairy Support	Dryland	LUC Class 6	3	3	3
Dairy Support	Dryland	LUC Class 7	1.5	1.5	1.5
Dairy Support	Pivot	XL	36	36	36
Dairy Support	Pivot	VL	28.2	28.2	28.2
Dairy Support	Pivot	L	20.8	20.8	20.8
Dairy Support	Pivot	M	18.5	18.5	18.5
Dairy Support	Pivot	H	16.2	16.2	16.2
Dairy Support	Pivot	PdL	10.4	10.4	10.4
Dairy Support	Pivot	Pd	8.1	8.1	8.1
Dairy Support	Pivot	LUC Class 4-6	20.8	20.8	20.8
Dairy Support	Pivot	LUC Class 6	3	3	3
Dairy Support	Pivot	LUC Class 7	1.5	1.5	1.5
Dairy Support	Borderdyke	XL	69.1	69.1	69.1
Dairy Support	Borderdyke	VL	38.2	38.2	38.2
Dairy Support	Borderdyke	L	26.3	26.3	26.3
Dairy Support	Borderdyke	M	23.3	23.3	23.3
Dairy Support	Borderdyke	H	20.1	20.1	20.1
Dairy Support	Borderdyke	PdL	13.1	13.1	13.1
Dairy Support	Borderdyke	Pd	10	10	10
Dairy Support	Borderdyke	LUC Class 4-6	26.3	26.3	26.3
Dairy Support	Borderdyke	LUC Class 6	3	3	3
Dairy Support	Borderdyke	LUC Class 7	1.5	1.5	1.5
Sheep & Beef	Dryland	XL	6.2	6.2	6.2
Sheep & Beef	Dryland	VL	5.7	5.7	5.7
Sheep & Beef	Dryland	L	5.1	5.1	5.1

Sheep & Beef	Dryland	M	5	5	5
Sheep & Beef	Dryland	H	4.8	4.8	4.8
Sheep & Beef	Dryland	PdL	2.6	2.6	2.6
Sheep & Beef	Dryland	Pd	2.4	2.4	2.4
Sheep & Beef	Dryland	LUC Class 4-6	4	4	4
Sheep & Beef	Dryland	LUC Class 6	3	3	3
Sheep & Beef	Dryland	LUC Class 7	1.5	1.5	1.5
Sheep & Beef	Pivot	XL	29.1	29.1	29.1
Sheep & Beef	Pivot	VL	22.7	22.7	22.7
Sheep & Beef	Pivot	L	16.8	16.8	16.8
Sheep & Beef	Pivot	M	15.2	15.2	15.2
Sheep & Beef	Pivot	H	13.3	13.3	13.3
Sheep & Beef	Pivot	PdL	8.5	8.5	8.5
Sheep & Beef	Pivot	Pd	6.6	6.6	6.6
Sheep & Beef	Pivot	LUC Class 4-6	16.8	16.8	16.8
Sheep & Beef	Pivot	LUC Class 6	3	3	3
Sheep & Beef	Pivot	LUC Class 7	1.5	1.5	1.5
Sheep & Beef	K-line	XL	29.1	29.1	29.1
Sheep & Beef	K-line	VL	22.7	22.7	22.7
Sheep & Beef	K-line	L	16.8	16.8	16.8
Sheep & Beef	K-line	M	15.2	15.2	15.2
Sheep & Beef	K-line	H	13.3	13.3	13.3
Sheep & Beef	K-line	PdL	8.5	8.5	8.5
Sheep & Beef	K-line	Pd	6.6	6.6	6.6
Sheep & Beef	K-line	LUC Class 4-6	16.8	16.8	16.8
Sheep & Beef	K-line	LUC Class 6	3	3	3

Sheep & Beef	K-line	LUC Class 7	1.5	1.5	1.5
Sheep & Beef	Borderdyke	XL	62.3	62.3	62.3
Sheep & Beef	Borderdyke	VL	64.4	64.4	64.4
Sheep & Beef	Borderdyke	L	23.7	23.7	23.7
Sheep & Beef	Borderdyke	M	21.4	21.4	21.4
Sheep & Beef	Borderdyke	H	18.4	18.4	18.4
Sheep & Beef	Borderdyke	PdL	12.1	12.1	12.1
Sheep & Beef	Borderdyke	Pd	9.2	9.2	9.2
Sheep & Beef	Borderdyke	LUC Class 4-6	34.4	34.4	34.4
Sheep & Beef	Borderdyke	LUC Class 6	3	3	3
Sheep & Beef	Borderdyke	LUC Class 7	1.5	1.5	1.5
Arable	Dryland	XL	26	26	26
Arable	Dryland	VL	17.3	17.3	17.3
Arable	Dryland	L	18	18	18
Arable	Dryland	M	10.8	10.8	10.8
Arable	Dryland	H	4	4	4
Arable	Dryland	PdL	9	9	9
Arable	Dryland	Pd	2	2	2
Arable	Dryland	LUC Class 4-6	4	4	4
Arable	Dryland	LUC Class 6	1.5	1.5	1.5
Arable	Dryland	LUC Class 7	3	3	3
Arable	Pivot	XL	29	29	29
Arable	Pivot	VL	21.9	21.9	21.9
Arable	Pivot	L	24.1	24.1	24.1
Arable	Pivot	M	17.9	17.9	17.9
Arable	Pivot	H	10.3	10.3	10.3

Arable	Pivot	PdL	12	12	12
Arable	Pivot	Pd	5.1	5.1	5.1
Arable	Pivot	LUC Class 4-6	24.1	24.1	24.1
Arable	Pivot	LUC Class 6	3	3	3
Arable	Pivot	LUC Class 7	1.5	1.5	1.5
Arable	K-line	XL	29	29	29
Arable	K-line	VL	21.9	21.9	21.9
Arable	K-line	L	24.1	24.1	24.1
Arable	K-line	M	17.9	17.9	17.9
Arable	K-line	H	10.3	10.3	10.3
Arable	K-line	PdL	12	12	12
Arable	K-line	Pd	5.1	5.1	5.1
Arable	K-line	LUC Class 4-6	24.1	24.1	24.1
Arable	K-line	LUC Class 6	3	3	3
Arable	K-line	LUC Class 7	1.5	1.5	1.5
Arable	Borderdyke	XL	29	29	29
Arable	Borderdyke	VL	21.9	21.9	21.9
Arable	Borderdyke	L	24.1	24.1	24.1
Arable	Borderdyke	M	17.9	17.9	17.9