BEFORE INDEPENDENT HEARING COMMISSSIONERS

AT HAMILTON

IN THE MATTER:	of the Resource Management Act 1991
AND	
IN THE MATTER:	of the hearing of submissions on Proposed Plan Change 1 and Variation 1 to the Waikato Regional Plan (Healthy Rivers)

STATEMENT OF EVIDENCE OF JAMES KENNETH ALLEN FOR FONTERRA CO-OPERATIVE GROUP LTD (SUBMITTER 74057)

BLOCK 2 HEARINGS

FARM MANAGEMENT

3 MAY 2019

RICHMOND CHAMBERS

Counsel Instructed
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1. EXECUTIVE SUMMARY

1.1 I am supportive of the long-term goals of the Te Ture Whaimana o Te Awa o Waikato - Vision and Strategy (**Vision and Strategy**) that seek to ensure that the Waikato / Waipa Rivers are safe for both swimming and the harvesting of food.

1.2 I am supportive of the proposed timeframes for the implementation of proposed Plan Change 1 to the Waikato Regional Plan (**PC1**).

1.3 In my evidence I cover aspects related to Fonterra Co-operative Group Limited's (**Fonterra**) submissions and further submissions on both the on-farm provisions, and point-source discharges as they relate to the disposal of industrial wastewater onto farmland.

1.4 I am supportive of the proposed methods to manage nitrogen, i.e:

(a) establishment of a Nitrogen Reference Point (**NRP**);

(b) a requirement for landowners to farm 'at or below' their current NRP level;

(c) a requirement for those pastoral landowners who are leaching above the dairy 75th percentile to reduce their N leaching to the 75th percentile or below; and

(d) development of mitigation measures to manage nitrogen, phosphorus, sediment and microbial pathogens through the use of a Farm Environment Plan (**FEP**).

1.5 For those landowners who are currently leaching above the 75th percentile, and are required to reduce their N leaching, many of these farmers should be able to make relatively minor changes to their farm system which will enable them to farm at or below the 75th percentile. For example, this could involve changes to timing of nitrogen applications, changes to effluent management, changes in stocking rate, manipulation of the diet, and possibly some infrastructure changes. There will be other farmers who require some significant farm system change and/or investment in infrastructure in order to meet the

75th percentile target. Finally, there will be a small proportion of farmers who simply cannot meet the 75th percentile target without significant change to farming system, and potentially land use change. Generally speaking, the costs and effort of making reductions to meet the 75th percentile will depend on the level of nitrogen leaching reduction required.

1.6 For some landowners there are some farm management efficiencies available that will result in a small lift in profitability by reducing their N leaching below the 75th percentile. For most landowners there will be some loss of profitability when they reduce their N leaching to below the 75th percentile. An AgResearch report evaluating the financial impact of dairy farms moving from above the 75th percentile to 'at or below' the 75th percentile stated: "*The corresponding range in effects of profitability was +$106/ha to -$514/ha, with an average of -$143/ha",* noting that this was a case study approach on dairy farms, and may not be fully representative.

1.7 Three of Fonterra's manufacturing sites in the Waikato River Catchment are authorised via a number of resource consents to discharge industrial process wastewater to land via irrigation. In managing this activity, Overseer is used to model nitrogen losses below the root zone.

1.8 I have a good understanding of the wastewater irrigation operations undertaken on these farms, and I have reviewed the most recent technical reports that were developed for consenting and/or compliance purposes.

1.9 The range of nitrogen leaching (kg N/ha/yr) on the farms that received the wastewater is comparable to other dairy farms in the Waikato catchment that do not receive the wastewater.

2. QUALIFICATIONS, EXPERIENCE AND BACKGROUND

2.1 My full name is James Kenneth Allen. I am managing director of AgFirst Waikato (2016) Limited (**AgFirst Waikato**).

2.2 I have been working as an agricultural consultant since 1996, based in the Waikato region for all of that time. From 1996 to 2001 I was

employed by the agricultural consultancy firm Agriculture New Zealand Limited. Since 2002 I have been self-employed with AgFirst Waikato. Together with my business partners we have grown the scale of the business to be the largest agricultural consultancy business in the Waikato region, covering a range of disciplines.

2.3 The core base of my experience relates to farm management consultancy.

2.4 I hold a Bachelor of Agricultural Commerce (farm management and rural valuation majors) from Lincoln University, New Zealand, and a Professional Masters in Agribusiness, also from Lincoln University. I am a Fellow and registered member of the New Zealand Institute of Primary Industry Management, where I was national president for two years. I am also a director on the Nutrient Management Adviser Certification Programme Limited.

2.5 Relevant qualifications include accreditation in Farmax, intermediate and advanced Sustainable Nutrient Management, and NZIPIM Dairy Farm Systems Certified Consultant.

2.6 My experience in the area of farm systems management relevant to the statement of evidence includes:

(a) Delivery, project management and participation in the steering committee of the Sustainable Milk Plans programme delivered in the Upper Waikato Catchment.

(b) Experienced user of both Farmax Dairy and Overseer, which are both recognised industry tools to analyse farm systems.

(c) Delivery of estimated Nitrogen Reference Points, Farm Environment Plans and farm system change analysis.

(d) Day to day consultancy work in the Waikato and Waipa districts. This provides a first-hand understanding of the wide range of issues surrounding management of dairy farms in these catchments. This includes financial management, environmental planning, strategic planning and nutrient management.

(e) Project management of the Dairy Push extension programme, Upper Waikato (2007 - 2011).

2.7 Relevant publications include:

(a) Co-author Upper Waikato Nutrient Efficiency Study (2009).

(b) Presentation to NZARM (NZ Association of Resource Management) conference (2015) – “The role of a farm consultant in facilitating change of farms”.

(c) Provider of the MAF Farm Monitoring Report Waikato Dairy (1997 - 2005). Subsequently AgFirst Waikato now publishes its own annual dairy and sheep and beef financial report for the Waikato region each year.

3. CODE OF CONDUCT

3.1 I have read the Expert Witness Code of Conduct set out in the Environment Court's Practice Note 2014 and I agree to comply with it. I confirm that the issues addressed in this Statement of Evidence are within my area of expertise, except where I state I am relying on the specified evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from my expressed opinion.

3.2 In terms of the matters in the Expert Witness Code of Conduct, I record that I am a shareholder in a dairy farm which is located in the Waipā catchment. Also for disclosure it is noted that AgFirst Waikato submitted with regard to PC1, with regard to the use of nitrogen trading as an economic tool.

4. SCOPE OF EVIDENCE

4.1 My evidence is focussed on the management of nitrogen within the PC1 framework and how the plan framework as proposed will impact on farmers.

5. SUPPORT FOR THE VISION AND STRATEGY

5.1 I have read the Vision and Strategy as outlined in Chapter 3.11. I am supportive of the overall intent of PC1, being the first stage of achieving the Vision and Strategy set out in the Waikato River legislation, with an 80 year intergenerational timeframe to achieve the water quality targets. This intergenerational timeframe recognises that the implementation of regulation to achieve those targets will be costly, difficult, and will involve considerable land use change.

5.2 The first phase of the 80 year plan is a 10 year plan to implement a range of actions that will be required to achieve 10% of the required change between current water quality and the required water quality in 2096.

6. MANAGEMENT OF NITROGEN WITHIN THE PLAN CHANGE ONE FRAMEWORK

6.1 My interpretation of the proposed rules of PC1 indicate that management of nitrogen within the PC1 framework will be undertaken with the following mechanisms:

(a) interim restrictions (non-complying activity) on land use change for intensification;

(b) establishment of a NRP;

(c) ensuring farmers under the 75th percentile do not exceed their NRP on a five-year rolling output average basis;

(d) for those landowners who are operating above the 75th percentile of the NRP, they will be required to reduce their N leaching to that of the 75th percentile by 1 July 2026; and

(e) through the preparation and implementation of a FEP prepared by a qualified professional, manage nitrogen, sediment, phosphorous and microbial pathogens.

6.2 As I understand it, the purpose of creating a NRP for landowners is to establish a reference point from which to track changes to the

(modelled) amount of nitrogen leaching below the root zone at a property level.

6.3 I am supportive of the creation of a baseline represented by the NRP. In my opinion establishing a reference point for most farms and then requiring a reporting regime that ensures the reference point is not exceeded, alongside the reductions required under the 75th percentile approach and the efficiency actions included in all FEPs, is an effective way to ensure total N loss across the catchment decreases.

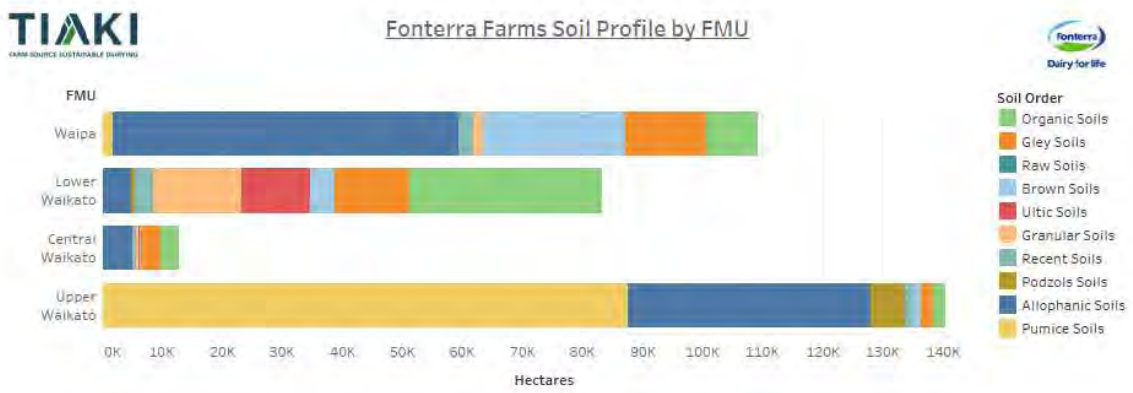
7. 75TH PERCENTILE

7.1 Without the 75th percentile rule there is no immediate need for those who have a relatively high level of nitrogen leaching to make any reductions in their nitrogen leaching beyond the efficiency actions that might be identified in the FEP.

7.2 The 75th percentile rule is calculated based on nitrogen leaching numbers in each FMU. In principle I would prefer the rules for PC1 to be based on a sub catchment basis rather than an FMU basis, however I understand that there was a lack of meaningful data available to manage PC1 on a sub catchment basis. If PC1 was modified to operate on a sub catchment basis rather than an FMU basis, my comments regarding the NRP baseline and 75th percentile would still apply.

7.3 Key drivers of nitrogen leaching are soil type, rainfall, pasture growth, imported feed, nitrogen fertiliser use, (and as a consequence) stocking rate and production. I understand there is concern by some parties for those landowners with free draining or “leaky soils”, e.g. pumice, in an FMU which contains a variety of soil types, in that this could put them at a perceived disadvantage. The FMU where this is most likely to have the highest impact is the Upper Waikato, which contains a mixture of pumice, allophanic and other soil orders. The following chart shows that in the Upper Waikato FMU over 60% of soils are pumice soils. The implication here is that the soil type with the highest leaching potential is the predominant soil type in that FMU, and thus this largely negates this concern. However, I do accept that there will be instances of farmers with “leaky soils” in an FMU which puts them at a comparative

disadvantage. This may well cause some concern and difficulties for the particular landowner; once again the intent of any plan should be to create the least inequitable situation, but there will always be those who are caught out. Additionally, it should be remembered, all other things being equal, those farming on “leaky soils” and/or particularly those in high rainfall situations will be leaching more nitrogen into the waterways. The Fonterra Supply Farms Soil Profile by FMU is shown at **Figure 1** below.



	FMU			
Soil Order	Central Waikato	Lower Waikato	Upper Waikato	Waipa
Organic Soils	2,836	31,590	1,775	8,492
Gley Soils	3,224	12,414	2,138	13,298
Raw Soils		217	5	
Brown Soils	242	3,988	1,182	23,625
Ultic Soils	195	11,494		10
Granular Soils	496	14,771		1,664
Recent Soils	590	3,001	1,412	2,638
Podzols Soils		600	5,709	
Allophanic Soils	4,954	4,843	40,564	57,434
Pumice Soils	166	88	87,488	1,880
Grand Total	12,703	83,006	140,272	109,041

	Soil Drainage					
Soil Order	Very poorly drained	Poorly drained	Imperfectly drained	Moderately well drained	No Data	Well drained
Organic Soils	19,701	24,992				
Gley Soils	1,031	29,659	383			
Raw Soils					221	
Brown Soils		170	21,597	3,126		4,143
Ultic Soils		636	5,240	4,604		1,220
Granular Soils		410	482	12,816		3,223
Recent Soils			1,674	1,756		4,212
Podzols Soils		600		17		5,692
Allophanic Soils			823	160		106,811
Pumice Soils			2,564	2,391		84,668
Grand Total	20,733	56,467	32,763	24,869	221	209,969

Figure 1: Soil Order by FMU - based on Fonterra supply farms, 15/16

7.4 I would also like to comment on the ability of farmers to reduce their nitrogen leaching to at or below the 75th percentile. Some indicative information provided by Fonterra (see **Figures 2 – 5** below) indicates that many dairy farms who are above the 75th percentile are actually farming close to the 75th percentile rather than being at the extreme end (i.e. upper end of the percentile range). In my experience many farmers should be able to make relatively minor changes to their farm system which will enable them to farm at or below the 75th percentile. For example, this could involve changes to timing of nitrogen applications, changes to effluent management, changes in stocking rate, manipulation of the diet, change in cultivation and cropping programmes, and possibly some infrastructure changes. There will be other farmers who require some significant farm system change and/or investment in infrastructure in order to meet the 75th percentile target. Finally, there will be a small proportion of farmers who simply cannot meet the 75th percentile target without significant change to farming systems, and land use change might be required.

7.5 An indication of the 75th percentile figures for the FMUs, and the number of dairy farms above this level are shown in the following figures (**Figures 2 – 5**), based on Fonterra data.

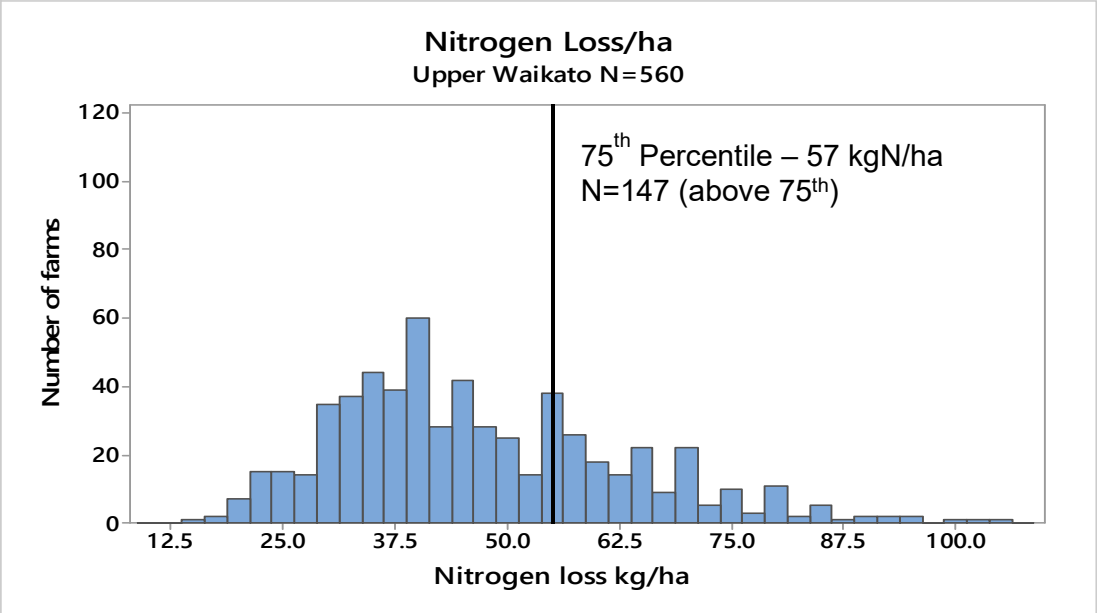


Figure 2: Source: Fonterra Data set 15/16 Season (Fonterra supply farms only)

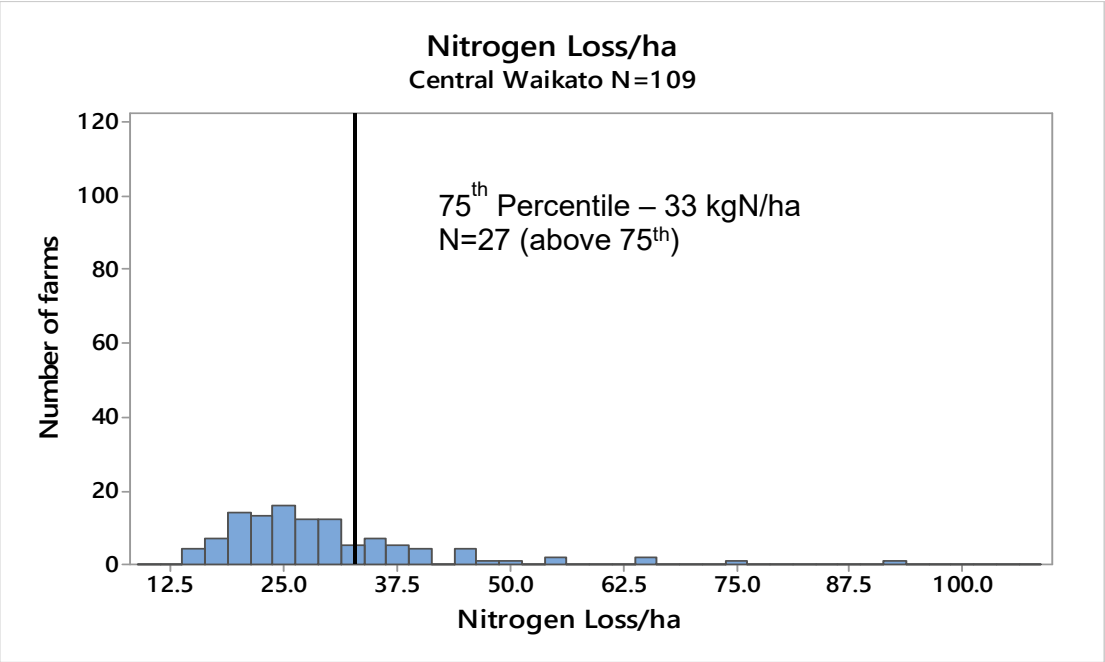


Figure 3: Fonterra Data set 15/16 Season (Fonterra supply farms only)

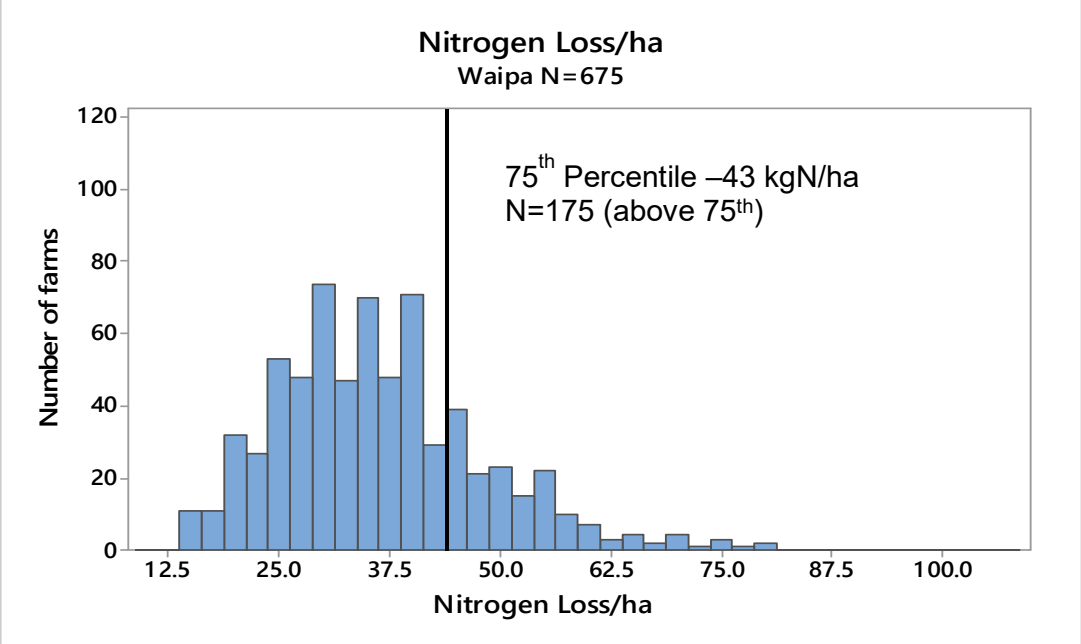


Figure 4: Fonterra Data set 15/16 Season (Fonterra supply farms only)

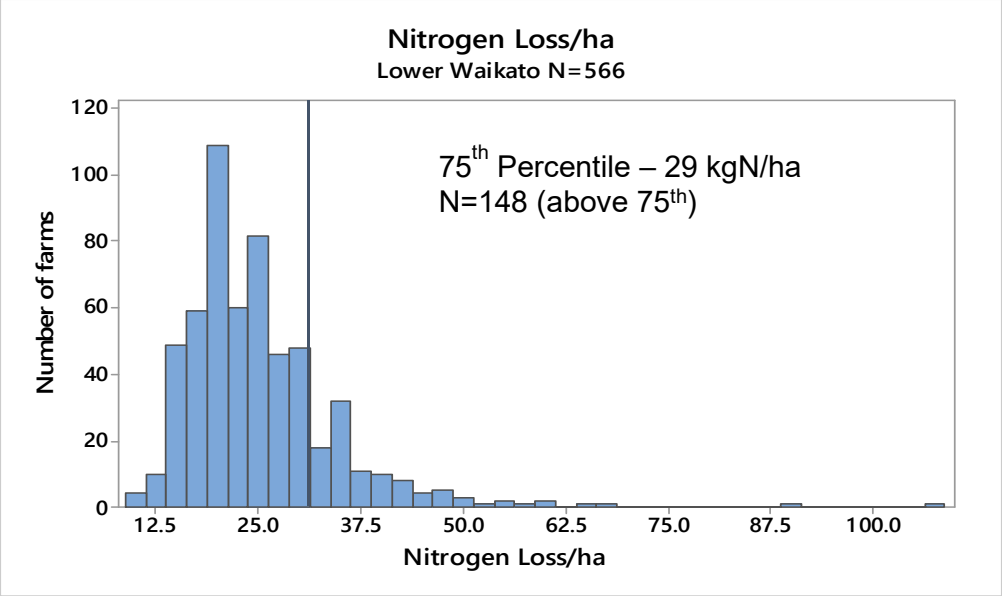


Figure 5: Fonterra data set 15/16 Season (Fonterra supply farms only)

7.6 The box and whisker chart shown below (**Figure 7**) illustrates the range in N loss (kg/ha), grouped by FMU. The upper and lower limits of the box demonstrate the 25th and 75th percentile, with the mid line being the median. The whisker lines represent the upper and lower quartiles, with the asterisks being outliers.

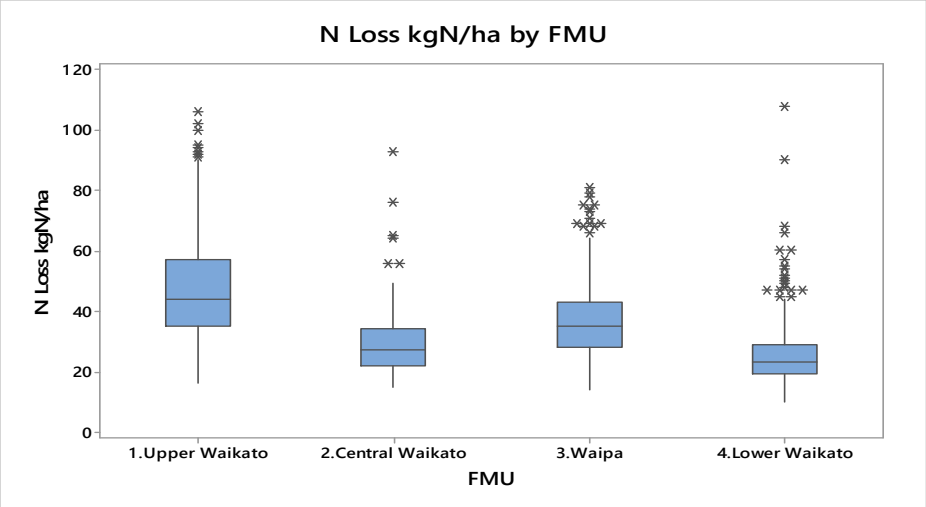


Figure 7: Fonterra data set (15/16 season (Fonterra supply farms only)

7.7 I believe the 75th percentile rule will greatly assist the likelihood of achieving the N reductions required by PC1. The following table is based on internal analysis undertaken by Fonterra, based on Fonterra supply farms in the Waikato and Waipa catchments in the 2015/16 season. I am relying on the expertise of Fonterra to ensure their calculations and assumptions are correct. The analysis examines the impact of total N leaching by requiring those leaching above the 75th percentile to reduce their N leaching to the 75th percentile. As the table illustrates, the impact of this requirement is a reduction in N leaching of 814 tonnes, representing a 7.3% reduction. Note that this analysis is based only on the Fonterra supply farms in the catchment. This is shown in **Figure 8** below.

Original N Level (tonnes)	75th Percentile reduction (new level)	Percentage reduction
11,104	10,290	7.3

Figure 8: Catchment load N reductions modelled using the 75th percentile modelling. Source: Fonterra supply farms 15/16 season

7.8 To give support to my comment regarding the impact of the 75th percentile rule, I refer to an AgResearch[1] Report (Ledgard, 2017) prepared in 2017. This report evaluated the impact of undertaking mitigation measures in order to shift dairy farms from above the 75th percentile to at/below the 75th percentile.

7.9 To paraphrase, "*Across the ten farms where mitigations were evaluated, their integration into the farm system was associated with a calculated change in milk solids production of +2 to -219kgMS/ha/yr (+0.1% to -17%). The corresponding range in effects of profitability was +$106/ha to $514/ha, with an average of -*

[1] AgResearch (S Ledgard, N Mapp, N Bartlett) 2017. Understanding Nutrient losses on Waikato case study farms and effectiveness of selected mitigation options. Report for Fonterra and DairyNZ.

$143/ha.

For all ten farms evaluated, a decrease in N leaching down to the 75th percentile could be achieved by integration of 1-5 mitigations that were farm management changes that were easily understood, i.e. no major farm system changes were required."

7.10 In addition to the evidence present by the AgResearch report, an AgFirst report[2] conveyed a similar message. When examining a range of farming systems, it was found that many farmers could implement a range of mitigations that would achieve a reduction in N leaching. The impact on production and profitability ranged from positive to negative, dependant on a range of factors that included current performance levels, farm system and level of infrastructure. A report by Perrin Ag that examined the impact of Nitrogen restrictions for the drystock sector drew similar conclusions.[3]

7.11 Various nitrogen mitigations strategies have been documented in a Fertiliser and Lime Research Centre (**FLRC**) report.[4] This report summarised amongst the effectiveness of various mitigation strategies, that there is no one size fits all. While a mitigation strategy may result in a profit for one farming operation, it may have a significant impact on another system.

7.12 The studies show that a reduction of 0- 20% leaching could have a range of impacts on profitability. Whilst some minor changes resulted in a neutral or even slightly positive change in farm profitability, other changes in farm practice resulted in decreased profitability. This highlights the point that analysis and changes need to be made on a farm specific basis.

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2 AgFirst (Allen, Dewes, Waugh et al) 2009. Upper Waikato Nutrient Efficiency study

3 Perrin Ag, 2013. Upper Waikato Drystock Nutrient Efficiency Study

4 Howarth, S., Journeaux, P., 2016. Review of Nitrogen Mitigation Strategies for Dairy Farms - is the method of analysis and results consistent across studies? In: *Integrated nutrient and water management for sustainable farming*. (Eds L.D. Currie and R.Singh). http://flrc.massey.ac.nz/publications.html. Occasional Report No. 29. Fertilizer and Lime Research Centre, Massey University, Palmerston North, New Zealand.

7.13 To achieve more than a 20% reduction in leaching most studies suggest there will be an increasingly negative impact on profit. This is shown in **Figure 9** below.

Mitigation Strategy	Effect of Nitrogen	Effect on Profit
Supplementary feeding – Low N Feeds	3–42% reduction	1–10% loss
Nitrogen fertiliser – eliminating winter applications	12–15% reduction	minor
Nitrogen fertiliser – reducing or removing all applications	26–43% reduction	1–10% loss
On/off grazing	25–56% Southland 9-23% Waikato/BOP	11% decrease to 14% profit depending on infrastructure

Figure 9 – Relationship between Nitrogen reduction and profit

7.14 There are a large number of mitigation strategies available to higher loss farms that can be tailored to provide the most efficient suite of actions for a particular farm to reduce nitrogen leaching and to assist them with complying with the relevant 75th percentile number.

7.15 AgFirst has undertaken various modelling scenarios to determine the key drivers and costs from high N leaching farms, as clients evaluate their farm systems in anticipation of making changes. An example of such modelling work is a dairy farm in the Upper Waikato FMU with pumice soils, a stocking rate of 2.7 cows/ha and production of 468 kgMS/cow. The key inputs were 235 kg of N fertiliser/ha, 1.5t DM/cow of imported feed (approximately 50:50 PKE to maize silage and maize grain) and 8.5% of the farm in winter crops. Presented below is a table summarising the current operation with infrastructure improvements and the modelling results from various mitigation strategies with the cost associated as a per unit of N leached. This is shown in **Figure 10** below.

	Infrastructure (current baseline)	Reduce Winter Crop	Reduce Nitrogen Fertiliser	Dry off Early	Retire Land	Reduce Stocking Rate
Operating Profit ($ total)	$565,000	$582,000	$537,000	$511,000	$555,000 +capital	$555,000
Change in Operating Profit ($ total)		+$17,000	-$28,000	-$54,000	-$10,000	-$10,000
N Leached (kg N/ha)	64	59	48	63	61	64
Reduction in N leaching (kg N/ha)		-5	-16	-1	-3	0
Cost per kg N leached ($/kg N)		+$3,400	-$1,750	-$54,000	-$3,333	-

Figure 10 – Upper Waikato FMU example

7.16 The above Figure 10 illustrates the financial impact of reducing the nitrogen leaching on a particular farm. Some of the management changes had a small change in operating profit (positive and negative), whilst others had a significant change in operating profit. Each farm needs to be analysed individually, as the combination of soil types, management systems and infrastructure will lead to a wide range in outcomes. For this particular farm a reduction in the use of nitrogen fertiliser resulted in a reduction in nitrogen leaching of 16kgN/ha/year.

7.17 Based on my experience around the economic implications of reducing nitrogen leaching, the costs are typically reflective of the level of change required. This is supported by some analysis that Mr Phil Journeaux at AgFirst has completed. Presented below is a figure Mr Journeaux presented at the NZIPIM 2016 conference, showing various farm systems, case studies and analysis and the associated costs based on the percentage reduction in nitrogen leaching.

7.18 Whilst there is naturally variation in the results from the various case studies, the chart illustrates the financial cost of making a 0-20% reduction in nitrogen leaching has a moderate impact (both positive and negative) on farm profitability, a requirement for large reductions in N leaching will likely have a substantial negative impact on farm profitability.

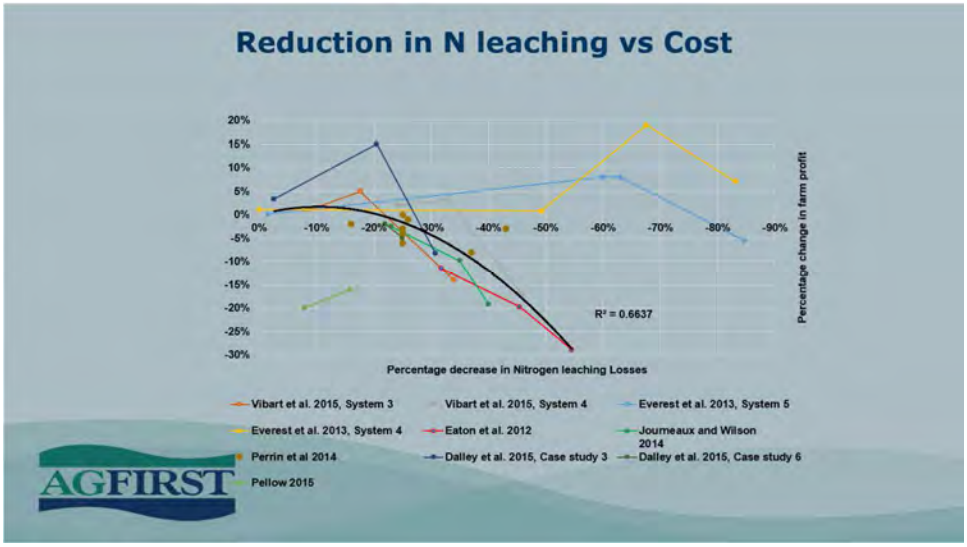

Figure 11 – Reduction in N leaching vs cost

7.19 Another, report, "The Southland Economic Project – Agriculture and Forestry" April 2017, also provides useful information on the financial impact of reducing Nitrogen leaching on dairy farms. Although the report is based on Southland regional data, in my opinion the data is relevant for the Waikato region. Forty-one dairy farms were included in the analysis. The following chart illustrates the point that for the majority of dairy farms, obtaining a small (0-10%) reduction in N leaching had a small (0 to -15%) impact on farm profitability. Obtaining a large (>25%) reduction in N leaching had a much larger financial cost. This is shown in **Figure 12 below**.

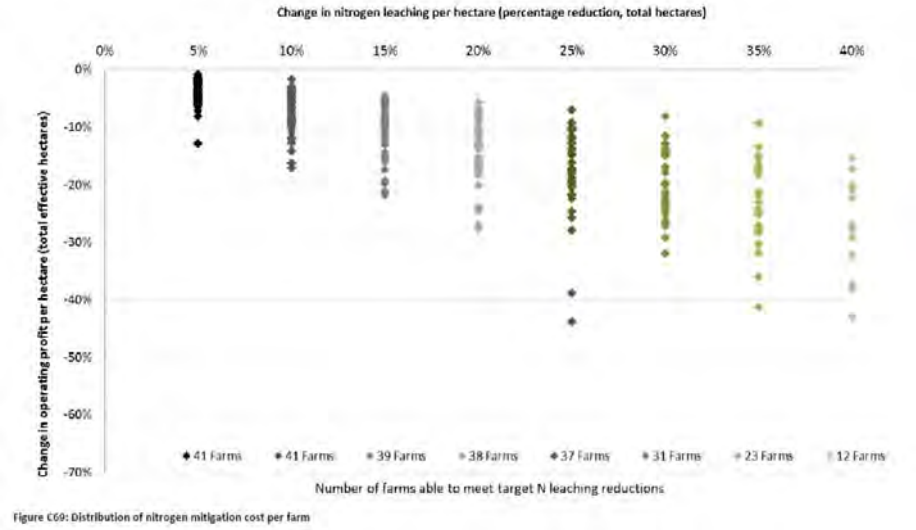

Figure 12: The Southland Economic Project, Agriculture and Forestry, E.Moran, 2017, p250

8. FONTERRA'S INDUSTRIAL PROCESS WASTEWATER DISCHARGES TO FARMLAND

8.1 Wastewater from three Fonterra manufacturing sites in the Waikato catchment (Hautapu, Reporoa and Lichfield) is applied to farmland which is either owned by Fonterra, or owned by other parties, referred to as third party farms. The farming types comprise a mixture of dairy, sheep and/or cut and carry grazing systems.

8.2 It is noted the Hautapu and Reporoa sites are in the process of re-consenting for wastewater discharge. Any wastewater discharge and associated farming activity will be assessed in the context of the new rules in PC 1.

8.3 I observe that over time Fonterra has made a conscious effort to reduce the level of nitrogen leaching from both its own farms and the third party farms. The evidence of Dr Martin Neale, on behalf of Fonterra, explains these changes in more detail.

8.4 This has been implemented from a combination of improvements in the wastewater treatment processes to reduce nutrient

concentrations (such as additional treatment prior to irrigation), changes in cleaning products to reduce nitrogen usage (however this has increased P usage), increase in irrigation area and changes in irrigation practices, and changes in farming system (i.e. reduction in stock intensity and move to cut-and-carry) to reduce overall groundwater leaching of nitrogen.

8.5 I have reviewed the summary results of the Overseer modelling for each of the Fonterra-owned and third party farms within the PC1 catchment area. The results of the Overseer modelling for the 2017/18 season indicate a range in nitrogen leaching from 13 - 85 kgN/ha/year. This range of nitrogen leaching figures is comparable to what I see in other dairy farming operations in the Waikato catchment that do not receive Fonterra wastewater, and in many cases would be below the 75th percentile. The majority of the third party farms are already operating below the 75th percentile. I believe Fonterra will be able to make further adjustments to the management of the wastewater process to ensure all of the third party farms reduce the nitrogen leaching to below the 75th percentile.

9. CONCLUSION

9.1 In summary, I am supportive of the proposed rules in PC 1 around the 75th percentile rule regarding nitrogen management. For most farmers the changes required will be achievable, but will have significant impacts on those with greater reductions to make. There will be a small group of farms that will struggle to decrease to the required level without significant decreases in profitability. For a small proportion, a change in land use might be the only option.

James Allen
3 May 2019

References:

AgResearch (S Ledgard, N Mapp, N Bartlett) 2017. Understanding Nutrient losses on Waikato case study farms and effectiveness of selected mitigation options. Report for Fonterra and DairyNZ.

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