IN THE MATTER **of the Resource Management Act 1991**

AND

IN THE MATTER **of the hearing of submission on Proposed Plan Change 1 (and Variation 1 to the Waikato Regional Plan)**

TOPIC 2

BY **FEDERATED FARMERS OF NEW ZEALAND INC, FEDERATED FARMERS OF NEW ZEALAND (WAIKATO REGION) 1999 INCORPORATED, FEDERATED FARMERS OF NEW ZEALAND – ROTORUA TAUPO PROVINCE INCORPORATED, FEDERATED FARMERS OF NEW ZEALAND (AUCKLAND PROVINCE) INCORPORATED**

("FEDERATED FARMERS")

Submitter with ID: 74191

To **WAIKATO REGIONAL COUNCIL**

("WRC")

STATEMENT OF REBUTTAL EVIDENCE OF IAN FRANCIS MILLNER FOR FEDERATED FARMERS IN RESPONSE TO BEEF + LAMB EVIDENCE DATED 10 MAY 2019

17 May 2019

FEDERATED FARMERS OF NEW ZEALAND

169 London Street
PO Box 447
Hamilton
Telephone: 021 110 3554
Email: mmeier@fedfarm.org.nz

STATEMENT OF REBUTTAL EVIDENCE OF IAN FRANCIS MILLNER

1. INTRODUCTION

1.1. My full name is Ian Francis Millner. My qualifications and experience are set out in my primary evidence dated 3 May 2019.

1.2. For the Topic 2 hearings, I have also prepared a statement of rebuttal evidence dated 10 May 2019. This rebuttal evidence contains my response to the statements of evidence filed on behalf of Beef + Lamb on 9 and 10 May 2019.

1.3. In relation to this rebuttal evidence, I confirm my compliance with the Code of Conduct for Expert Witnesses as set out in my primary evidence.

1.4. I have set out below my rebuttal evidence in respect of statements of evidence for Ms Corina Jordan, Dr Jane Chrystal and Dr Timothy Cox.

2. MS JORDAN'S EVIDENCE

2.1. I have reviewed the evidence of Ms Jordan dated 9 May 2019, and in particular, the track changes to PC1 attached to her evidence. My understanding of the planning framework is that:

a. Low nitrogen discharging activities would be able to increase to up to 30% above a table of N discharges for LUC classes or up to a table of stocking rates for LUC classes, as a permitted activity. They would not have to prepare a FEP. Other low intensity land uses, such as forestry, could convert to drystock as a permitted activity, provided the N limits (or stocking rates) for each LUC class are met.

b. Medium nitrogen discharging activities would be a controlled activity provided that they obtain a NRP, they do not exceed a certain nitrogen leaching rate or a certain percentile (Ms Jordan has indicated a preference in her evidence for the 60th percentile or an absolute number but has not specified a number in the track changes) and their risk using Fonterra's nitrogen risk scorecard assessment is orange or less.

c. All other farming activities would require consent as a restricted discretionary activity. They would need to obtain an NRP and reduce to

a certain N leaching rate or percentile (again, none is specified in the track changes) by 2026.

d. If farming activities do not reduce to the required N leaching rate or percentile, they are a non complying activity.

2.2. Based on my expertise and experience in farm planning and land management, I have several concerns with Beef + Lamb's proposed planning framework:

a. The framework is premised around a focus on nitrogen. For low N leaching activities, it is about providing for increases in N leaching without consideration of any of the other three contaminants. For medium to high N leaching activities, it is about requiring greater reductions as well as requiring FEPs to address the other contaminants. PC1 requires the management of four contaminants and without FEPs, I cannot see how phosphorous, sediment and E coli will be managed for lower N leaching activities under the permitted activity rule.

b. LUC is not the most appropriate basis for providing flexibility for low N leaching activities to increase or an appropriate basis to allocate nitrogen (whether this is for low intensity activities or for all activities).

c. I consider that the nitrogen risk scorecard assessment could have merit. However, it requires further consideration and development in respect of drystock farming for it to be of use as a farm planning tool or as a threshold or trigger point in regulation.

d. The framework relies on compliance with a N number based on LUC or with a stocking rate. This creates difficulties in terms of enforcement and in terms of whether or not the desired N number will be achieved.

2.3. I consider each of these issues in more detail below.

Focus on nitrogen

2.4. As explained in my rebuttal evidence dated 10 May 2019, I am concerned with Beef + Lamb's focus on nitrogen and focus on the dairy sector being responsible for a disproportionately high level of N discharges (when compared with the area of dairy land). PC1 requires the management of four

contaminants, not just nitrogen. It is widely accepted that controlling N will not manage the other three contaminants.[1] A comparison of current water quality states against 10 year targets shows that greater reduction in the other four contaminants are required than the required reduction in N.

2.5. In terms of management of farming activities and diffuse discharges to address water quality issues, I explained in my primary evidence that there is no "silver bullet" and that a tailored approach to considering critical source areas through FEPs is required.[2] My opinion is that this is likely to be the most effective and efficient way of addressing water quality. This is consistent with much of Mr Parkes' evidence for Beef + Lamb during the Topic 1 hearing. In particular, his evidence that the key potential water contaminants for the sheep and beef sector are sediment, P and faecal pathogens and management approaches should be focused on identifying and addressing overland flow pathways and Critical Source Areas (**CSAs**).[3]

2.6. In light of this, a fundamental concern I have with Beef + Lamb's proposed rule framework is that there is no requirement for low intensity farming activities (which have the ability to intensify to a certain level) to obtain a FEP or to address critical source areas. In addition, forestry could change land use to drystock or dairy, intensify up to the proposed LUC nitrogen numbers, and not have to address any of the other three contaminants.

2.7. The Tukituki catchment provides an excellent example of how a regulatory framework focussed heavily on N can lead to inefficient outcomes. As explained in my primary evidence dated 3 May 2019, I was directly involved in the development of the Tukituki Plan Change 6, as I was employed as a Senior Land Management Advisor at Hawkes Bay Regional Council at the time.

2.8. Tukituki has a LUC based N allocation framework to manage N. Tukituki is acknowledged to have a significant issue with P. In my experience the regulatory focus on N has created a distraction from managing P (and other

[1] Dr Mueller's primary evidence for Beef + Lamb dated 15 February 2019 acknowledges at paragraph 65 that there is a "lack of scientific evidence that the limitation of a single nutrient (in this case nitrogen) can successfully achieve water quality outcomes that ensure ecosystem health."
[2] Statement of Evidence of Ian Francis Millner dated 3 May 2019 at [4.1] to [4.16].
[3] Statement of Evidence of Richard Parkes dated 15 February 2019 at [42] and [44].

contaminants) as farmers (and the Council) are first and foremost concerned with regulatory risk and compliance. This means farmers are doing what is needed to become compliant with the N allocation rules and applying minimal effort to P loss. I am not saying that farmers in Tukituki need rules to control P or that P should be controlled in the same way as N has been, but I am saying that a fixation on N will not necessarily lead to an improvement in water quality. What is needed is a careful consideration of the particular critical source areas on each farm, as well as the water quality issues for the particular sub-catchment.

2.9. While there are some conditions placed on Beef + Lamb's proposed permitted activity rule (e.g. Schedule C must be complied with, no feedlots, no more than 5% of the land is used for cropping), my view is that these are not sufficient to address or mitigate potential sources of or pathways for sediment, phosphorous or E coli.

2.10. I can understand the desire of drystock farmers to have some flexibility with their nitrogen discharges and to not be rigidly benchmarked to historical levels. For example, nitrogen discharges may fluctuate with seasons, weather events and economic conditions. Farmers may wish to change sheep to beef stocking rates in response to the economic downturn in the wool market. They may hold onto stock for longer during drought due to an over supply of cull cows at meat processing plants. All of this will change their N leaching and will not likely be provided for if they need to adhere to an absolute N limit through the NRP (I note there may be some ability to respond to these situations if the NRP is calculated on a five year rolling average basis).

2.11. I can also foresee situations where flexibility could lead to better environmental outcomes. For example, retiring and planting gullies on a drystock farm may significantly reduce phosphorous and sediment (and potentially faecal coliform) but the farmer could not afford to it unless they intensified grazing activities on the flatter parts of the property. The effect of intensifying on the flats might be that nitrogen increases by 10% but that this is more than offset by reductions in the other contaminants.

2.12. In my view, Federated Farmers' proposal would better provide for such flexibility. I understand that proposal to involve providing flexibility for

changes in N for low intensity farms depending on the sub-catchment, the contaminants at issue and the proposed mitigations. In my opinion, this is a more appropriate response than to simply provide for N increases without consideration of the other contaminants.

2.13. A corollary of the Beef + Lamb proposal is that greater N reductions are required from medium and high intensity farming activities in order to create headroom to provide for N increases from low intensity activities. I have not seen any modelling or evidence from Beef + Lamb to show that the 10 year targets can be achieved through such an approach.

2.14. I am concerned about the cost to the dairy sector of making such reductions. My review of Dr Doole's modelling, his evidence and Mr Newman's evidence, is that the PC1 policy mix will impose significant cost on the dairy sector and the cost of N mitigations depends on where farms are at on a N cost abatement curve (but typically increase exponentially). In my view, requiring greater reductions from the dairy sector (say to the 60th percentile) will have significant economic impacts.

2.15. Again using the Tukituki as an example, the majority of drystock enterprises are able to farm easily within their allocation and a minority of intensive drystock and dairy enterprises need to make reductions toward their respective allocations. It is unlikely that the reductions of a few will be enough to counter the opportunity to do nothing or potentially increase N losses from the majority. While the balance of land use in the Tukituki is not the same as the Waikato, the effect may be similar in some sub catchments. This would likely affect the cumulative effect on water quality monitoring points in the lower Waikato river.

2.16. A requirement to reduce to the 60th percentile (or some other reduction below the 75th percentile) will not only hit dairy farmers. Dairy support (which are classified as drystock farms because they do not have a cowshed) will also be hit (this covers a range of activities from raising young dairy stock to grazing dairy herds not being milked). Sheep and beef finishing operations (those grazing sheep and beef for meat) will also require reductions. Any drystock property with areas of cropping will also be captured. All of these farm systems typically have less options for N reductions compared with dairy farms but their N discharges can be similar to dairy farms.

2.17. It is not clear why drystock farmers need the opportunity to increase N to the proposed LUC N limits (and 30% above). Extensive drystock land values are significantly lower than dairy land values. This restricts the amounts these farmers can borrow and therefore invest in intensifying their farms. Extensive drystock land tends to be hilly and have physical limitations that restrict their ability to intensify. In respect of any areas of forestry land that might wish to convert to drystock under the Beef + Lamb proposal, there are additional limitations in terms of the ETS (as carbon credits would need to be obtained and the liabilities associated with this are significant) that are likely to restrict land conversion.

2.18. I am concerned that the effect of the Beef + Lamb proposal is that high and medium intensity farms that have invested heavily in their properties are being required to make significant N reductions just so extensive drystock properties have the opportunity to intensity, in circumstances where they may be unlikely to do this. In my opinion it is inefficient to allocate N to parts of the landscape that either does not or cannot use it.

Use of LUC

2.19. As explained in my rebuttal evidence dated 10 May 2019, LUC is not an appropriate basis to allocate N. I do not support Ms Jordan's proposal that it is used as a basis for deriving a property level N allocation that extensive drystock properties can increase to. I also do not agree with her comment at paragraph 49 of her evidence that her proposed LUC based threshold "is directly linked to the productive capacity of land."

2.20. As explained at paragraphs 2.29 to 2.39 of my rebuttal evidence, I consider that there is no link between LUC and N, in particular, no link between the LUC classes and the way that Dr Mackay and Dr Dewes have derived N limits for each class.

2.21. For the reasons set out in my rebuttal evidence, I do not agree that the proposed permitted activity rule is a natural capital approach or would result in activities under this rule being farmed to their natural capital. Natural capital involves the consideration of all contaminants and all capitals (including human capital i.e. land management) are involved in the development and management of the farm enterprise. However, the

permitted activity rule considers just N (and uses LUC as the proxy for N – which I consider to be a very poor proxy).

2.22. An additional concern I have with the permitted activity rule is that there is no restriction on land use change. Notwithstanding my concerns above about the ETS creating a barrier for forestry land conversion, it is possible that a large area of forestry land could convert a small area of its land to dairy under the proposed permitted activity rule (by averaging the LUC allocation across the whole farm or farm enterprise). This would provide for no consideration of effects on the other contaminants or the effects of the increase in N on water quality.

2.23. I consider that a better approach is that proposed by Federated Farmers, which would provide for consideration of land use change as a discretionary activity and on an effects basis. In my view this is better than potentially providing for it as a permitted activity and better than only considering the N associated with land use change against LUC N allocations (which I consider to be a very poor proxy for N, natural capital and water quality).

Nitrogen risk scorecard

2.24. I have reviewed the nitrogen risk scorecard attached to Mr Richard Allen's primary evidence dated 15 February 2019. I consider that the risk based approach and assessment has some merit. However, as it only considers nitrogen and it is directed at dairy farming activities, it will require further development.

2.25. While I consider that there could be merit in incorporating the assessment into a FEP assessment, I consider that it is premature to include it into the planning framework as Ms Jordan proposes in her amendments to Rule 3.11.5.2A. If it was further developed, there could also be merit in using it as a threshold for intensity in the permitted activity rule proposed in PC1 (as opposed to the LUC permitted activity rule proposed by Beef + Lamb). Used in this way, it could be a useful tool for assessing whether low intensity farms ought to obtain FEPs based on an assessment of risk that is more tailored than consideration of N or stocking rate (which are blunt approaches). However, my view is that at this stage it is premature to incorporate it into the planning framework.

Compliance with N limits or stocking rates

2.26. Ms Jordan's proposal is that the permitted activity rule can be complied with by either meeting up to 30% more than the N limits in the LUC table or by meeting the stocking rates. I consider that both approaches are flawed and are not sufficiently certain to be used in a regulatory regime.

2.27. There are uncertainties inherent in Overseer, which is a model and, like any model, is only as good as its assumptions and limitations. While any Overseer number has a margin of error, this is compounded by the fact that Overseer version changes (which occur every six months) mean that the modelled N discharge for a particular farm can (and does) change with no change in farm system. Overseer version change and the uncertainties associated with the modelled number mean that many councils have struggled with using Overseer in a regulatory framework.

2.28. My concern is that the proposal to add 30% to the LUC table is not sufficient or appropriate to address the issues that will arise from the use of Overseer for Beef + Lamb's proposed permitted activity rule. For example, no consideration has been given to how changes in Overseer version will be applied or what will happen if as a result of a new version, an activity that was permitted exceeds the LUC table or how the N allocations in the table would be updated with version changes.

2.29. Given that the Beef + Lamb proposal relies on creating sufficient headroom through reductions from medium to high N discharging activities (to allow for low N discharging activities to increase and to still achieve the 10% overall improvement), the uncertainties in Overseer and in version change create further uncertainties about the reductions needed to achieve this.

2.30. My biggest concern is that implementing the Beef + Lamb proposal could create significant implementation issues for WRC staff. Significant resources would need to be directed towards better understanding Overseer, managing the risks and providing for version change. In my opinion, the resources would be better directed towards FEPs (which address all contaminants) and focusing on making progress with all four contaminants to improve water quality.

2.31. Finally, in respect of the proposed LUC table based on stocking rate for the permitted activity rule, my opinion is that stocking rate may be appropriate for setting a threshold above or below which additional standards or conditions apply, but it is not an appropriate basis for measuring compliance with an N allocation regime. My reasons are set out in more detail at paragraphs 4.1 to 4.12 of my earlier rebuttal evidence, but they include that two farms with the same overall stocking rate do not automatically have the same N loss due to variables such as soil type, climate, infrastructure etc.

2.32. In addition, while the notion of a stocking rate might appear a simple metric by which to gauge compliance, actual assessment of on farm stocking rates is a complex task. While Overseer does provide a revised stock unit (RSU) metric it is very dependent on key assumptions and performance data. To assess RSUs confidently within Overseer requires knowledge of pasture quality, animal growth rates and stock class. In my experience this data is never actually available (because they are spatially and temporally variable) and therefore reliance is placed on Overseer defaults. The RSU output from Overseer is a useful comparative tool but it should not be used in an absolute sense between properties.

3. DR CHRYSTAL'S EVIDENCE

3.1. I have set out below the key areas of Dr Chrystal's evidence that I disagree with.

Generalising drystock farm systems and focus on N

3.2. At paragraph 28, Dr Chrystal summarises her key points. These include that sheep and beef farms are constraining their farm systems and do not intensify because they operate low input farm systems and farm with their land's natural ability to support their farm system. I consider that this is a generalisation and over simplification, which only considers intensity from a N point of view and only considers certain types of drystock farm systems.

3.3. Drystock farms are diverse in type and in the system they operate. They include dairy support farms, which incorporate a range of activities involving dairy cows but which do not have a milking shed, such as grazing dairy cows during winter, raising dairy calves or grazing young dairy heifers.

3.4. Drystock farms include sheep and beef farms. These encompass a range of farm systems from intensive sheep and beef finishing, to sheep and beef breeding and to more extensive operations. Changing the ratio of sheep to cattle will also significantly change the intensity of the operation.

3.5. Drystock farms include deer and other animals like alpaca and goats or any of a number of combinations of the above. They typically include other activities such as cropping on an annual or occasional basis.

3.6. Given the diversity in the drystock farming sector, it is inaccurate to make generalisations. For example, N loss from beef finishing operations tend to be as high (and potentially higher if cropping is involved) as dairy. Operations with predominantly sheep will tend to be lower in nitrogen (due to smaller urine patches) as will hill country operations (predominantly due to larger land areas and steeper land that grows less grass so can support less stock and is less suitable country for heavy stock).

3.7. As explained in more detail below (in response to the case studies Dr Chrystal has relied on), Beef + Lamb's analysis has focused on extensive hill country operations. However, this is just one aspect of the drystock sector and, based on NIWA's 2015 report for TLG, the area of hill country sheep and beef is a small proportion of the overall land use in the catchment (11% of the catchment in 2012 compared with 22% of the catchment being intensive sheep and beef and 28% of the catchment being dairy).[4]

3.8. Dr Chrystal's key points at paragraph 28 of her evidence also only consider N. She does not consider the water quality effects of drystock farming activities on the other contaminants that are being controlled by PC1. Table 1 on page 11 of Dr Doole's primary evidence dated 3 May 2019 identifies that the load of E coli, phosphorous and sediment from the sheep and beef sector is 56%, 36% and 71% respectively. This indicates to me that these activities are not low intensity in the sense of these other contaminants and significant gain could be made through these activities addressing critical source areas through tailored FEPs.

[4] Review of historical land use and nitrogen leaching: Waikato and Waipa catchments, Waikato Regional Council Technical Report 2018/35 https://www.waikatoregion.govt.nz/services/publications/technical-reports/2018-technical-reports/tr201835/

Stocking rate

3.9. At paragraph 31 Dr Chrystal states that stocking rate is one of the key drivers of nitrogen leaching losses and there is a strong correlative relationship between it and N leaching. I do not agree. While Dr Chrystal lists activities that typically involve high N, there are many other factors, such as farm management, rainfall, soil and topography, that stocking rate does not proxy but which drive nitrogen losses. I refer further to my rebuttal evidence dated 10 May 2019 at paragraphs 4.1 to 4.12.

3.10. Dr Chrystal relies on four case study farms to support her views. It is not possible to understand and evaluate this without understanding the farms that have been chosen. However, I find it difficult to see how four farms can be representative of the wide range of farm systems, management approaches, topography, soils and climates in the Waikato.

Case study farms

3.11. At paragraph 96, Dr Chrystal refers to three case study farms. These farms are very low intensity, appear to have large areas of significant natural areas (**SNAs**), most likely protected, and also appear to be on steep land. They apply very little (if any) fertiliser and have very low stocking rates. Based on Dr Chrystal's assessment of one cow being 8.5su, they all appear to have less than one cow per hectare.

3.12. Accordingly, the farms represent a certain type of farm system all on a similar type of topography. The farms are also all in a similar geographical area and could be in the same or similar climate. They are also all in the Waipa FMU. This is not representative of drystock farms in the Waikato.

3.13. At paragraph 104, Dr Chrystal states that these farms are already significantly reducing their carrying capability and profitability by not applying N fertiliser. There could be a range of reasons for this. It could depend on the age and skills of the owners. It could depend on the value of the land and ability of the landowner to borrow or income generated off the land. It could depend on the lifestyle of the landowner e.g. whether they have off farm employment. In my opinion, it is not possible to make a generalisation that this applies to the 11% of hill country drystock properties in the

catchment, and my view is that it definitely would not apply to all drystock properties in the catchment or region.

3.14. Figures 27, 28, and 29 of Mr Andrew Burtt's evidence for Beef + Lamb for the Topic 1 Hearing usefully illustrates the variance in N use by system over time.[5] While the figures show that the use of N in the drystock sector has come from low base (i.e. very low levels were applied in the early 1990s) they also show that its use is increasing. Importantly, these graphs show significant lifts in the use of N around 2003-4. This was a period of good product prices and low N cost meaning it was cost effective to use N to boost performance. In my opinion, these graphs show that drystock farmers are not averse to the use of N to elevate grass growth and improve performance when the economic conditions are suitable. Again their actual use will be variable as the use of N within sheep and beef systems is typically tactical.

3.15. Obviously the use of N is not the only adaptation sheep and beef farmers can make to variable conditions. They can (and do) purchase supplements as and when needed or they can send stock away for grazing. The ability to send stock away for grazing would provide a complication for compliance with a stocking rate allocation.

3.16. I agree with Dr Chrystal that over the last 30 years the stocking rate on sheep and beef farms has fallen but my view is that this has happened as understanding of the drivers of animal performance have improved. It must also be remembered that the decline in stocking rate has been a decrease from historical highs in the early 1980s due to central government policy. It also needs to be understood that sheep and beef farms have developed better climate variability adaption techniques. In many cases this involves having a class of livestock that can be sold off farm when feed levels are low and easily replaced when feed levels improve.

3.17. Currently the most common class of livestock used in this tactical response is the purchase or sale of dairy beef. These animals are a by product of the dairy industry. Indeed the dairy industry is a huge supplier of beef animals to the drystock sector. This commercial opportunity has resulted in many sheep and beef enterprises owning lower numbers of capital stock (breeding

[5] Statement of Evidence of Andrew Neil Burtt dated 15 February 2019.

stock) and higher numbers of trade stock (thus impacting on stocking rate, particularly depending on the particular point in time, season or period over which stocking rate is measured).

3.18. A significant feature of the dairy beef market is that there is generally always a market for purchase and sale of stock. This is driven by the existence of many specialist beef finishing systems. In my view the specialist beef finishing systems will be in the ''vicinity'' of the 75th %ile and most likely above the 60th %ile. The impact of any N loss reduction from specialist beef systems on the wider drystock sector are unknown but in my opinion, given that around 22% of the catchment is intensive sheep and beef, would likely be significant.

3.19. The commercial connectivity between the dairy sector the sheep and beef sector (including the specialised finishing systems) further highlights the integrated nature of the wider primary sector where it is difficult to separate out the relative effects of policy interventions as they are undeniably interlinked. Therefore it is not accurate to compartmentalise the relative intensity and environmental effect based on sector.

4. DR COX'S EVIDENCE

4.1. Dr Cox's evidence describes how he recalibrated the nitrogen model used by NIWA to show current water quality and land uses. He describes how he modelled three potential N allocation approaches against the 80 year targets – equal allocation, flexible cap and a LUC allocation. His modelling showed that under any of the allocation approaches, significant land use change was required in order to achieve the 80 year targets. I have not seen in Dr Cox's evidence, or in any of the Beef + Lamb evidence, any modelling of the proposed N framework (i.e. low intensity increase to LUC and medium to high intensity reduce to the 60th percentile) against the 10 year targets.

4.2. In my view, there is a real risk that the 10 year targets will not be achieved (or a greater reduction than to the 60th percentile will be required). While it is difficult to assess whether low intensity drystock farms would intensify (as it will depend on a range of variables), I consider it a reasonable assumption that at least some of them will.

4.3. I also consider it to be a reasonable assumption that at least some of the forestry land in the catchment would convert to drystock (or potentially dairy), particularly as it would be a permitted activity (I note my concern above that there might be the possibility to convert to dairy under the permitted activity rule if the area of forestry land was large enough to average the LUC allocation and apply it to a small area to be converted to dairy). With around 169,500ha of forestry in the catchment (based on the NIWA 2015 report cited in footnote 4 of my evidence), there is a real risk that there could be significant changes in land use with no FEP or consideration of increases in N load or increases in the other contaminants (in saying this I also acknowledge the issue about the ETS and carbon credits raised above).

4.4. In respect of hill country farming increasing N, albeit as a result of changing sheep to beef ratios or a more radical change to farm system (such as moving from a breeding to a finishing operation), there has been no modelling of the effect of this on the other four contaminants. Given that these properties are not required to obtain a FEP, the effects could be very significant (and there is a real lost opportunity to address critical source areas). This is also unfortunate given that many sub-catchments are many times over E coli and sediment targets, but at or near N targets.

Dr Cox's model

4.5. Dr Cox's evidence dated 3 May 2019 (but filed on 10 May 2019) refers to the model that is explained in his evidence dated 15 February 2019. As part of understanding his evidence and analysis to support his position in respect of Beef + Lamb's proposed rule framework, I have reviewed his earlier evidence and have some responses to matters contained in that earlier evidence that impact on his later evidence, and how it is then relied upon to justify the Beef + Lamb rule framework.

4.6. The first thing I noticed about Dr Cox's modelling is that it has not been peer reviewed and only high level details of it are provided. While I am not a modeller, I have been involved in very complex and detailed modelling processes. A feature of these processes is the production of a peer reviewed report outlining data sources, calibration, assumptions and sensitivity (among others). I have not seen a report of this nature for Dr Cox's modelling.

4.7. Dr Cox says that he used the Agribase land use layer in his model (as he did not have access to the NIWA land use layer). At paragraphs 111 to 113 of his 15 February 2019 evidence, he explains differences he observed between the Agribase land use layer compared with land uses and N load apportionment reported from the NIWA modelling.

4.8. I consider that Agribase data needs to be treated with caution. Agribase is helpful for providing a rough indication of likely land use but, as explained in Dr le Miere's rebuttal evidence dated 17 May 2019, it is known to contain many inaccuracies. Analysis I have completed for the Tukituki catchment highlighted that the farm descriptions used in Agribase are subject to the definitions farmers use to describe their own enterprise. As an example it is common to find a farm that is predominately sheep classified as "sheep." However, these properties also contain significant numbers of cattle (beef and dairy) as opportunities arise as well as occasional cash crops. Accordingly, reliance should not be placed on the Agribase land use layer as being an accurate reflection of land uses in the Waikato.

4.9. At paragraph 69 of his 15 February 2019 evidence, Dr Cox refers to his findings about the TN losses from dairy. As part of that analysis he classifies dairy and dairy support as the "dairy sector" and states they are responsible for the majority of the TN load despite comprising 29% and 34% of the land area. In my opinion, dairy support ought to be classified as drystock.

4.10. As explained above, dairy support can represent a range of activities involving dairy cattle without a milking platform. It is widely accepted in literature and other plan changes that this is a drystock activity. For example, in Plan Change 10 for Rotorua, dairy support is included in the drystock sector (and receives a N allocation on that basis).

4.11. Dr Cox states at paragraph 70 of his 15 February 2019 evidence that drystock are the second largest individual contributor towards N but has the largest area of land in the catchment. I assume he has only looked at sheep and beef (although it is not clear whether he has included deer or other drystock activities). My view is that drystock is essentially any property carrying livestock that does not have a milking platform.

4.12. Dr Cox states at paragraph 72 of his 15 February 2019 evidence that P loads are evenly apportioned between dairy and drystock. In reality the loss of P from the landscape would be highly variable and not conform to generalised assumptions. He has not provided any comment about E coli or sediment, but I would expect these to be significantly larger (and this is consistent with Dr Doole's 3 May 2019 evidence, referred to above).

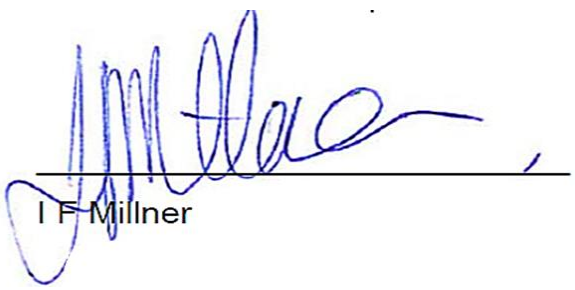
4.13. In Table 4, on page 31 of his 15 February 2019 evidence, Dr Cox sets out the N mitigations he modelled under his equal allocation simulation (which is the basis of his 3 May 2019 evidence). The mitigations modelled by Dr Cox differ from those modelled by Dr Doole.

4.14. Rather than estimate the likely cost of the equal allocation simulation, Dr Cox has ranked the mitigations by relative cost (with stock exclusion being the least expensive, so it is ranked highest, and tier 2 stock reduction the most expensive, so it is ranked lowest). In my opinion, these are not the mitigations that farmers would employ to reduce nitrogen.

4.15. Depending on the farm type, farm system, typography, climate and soils, there are many N mitigation options (although the specifics of each farm will mean that the options available to individual farms are significantly narrowed). I do not agree that stock exclusion and riparian planting are the number 1 and 2 N mitigations or that riparian buffers will reduce N by 20% and wetlands will reduce N by 60% as it is characteristics of the site that will determine the ultimate effectiveness of any mitigation.

4.16. For a dairy farm, the first mitigations are likely to be things like changing crop management, reassessment of supplements (amount and form), use of feed pads and standoff pads, and rationalisation of N use where the opportunity exists. Most (if not all) dairy farms have fenced their streams and established riparian buffers as part of the Sustainable Dairying Water Accord.

4.17. For all of these reasons I consider that caution ought to be exercised in placing reliance on Dr Cox's modelling.



I F Millner