

IN THE MATTER

of the Resource Management Act 1991

AND

IN THE MATTER

of appeals lodged against proposed Plan Change 2
to the Manawatu-Whanganui One Plan

JOINT WITNESS STATEMENT OF FARM SYSTEM EXPERTS

25 August 2022

INTRODUCTION

1. This joint expert witness statement relates to the appeals lodged against proposed Plan Change 2 (PC2) of the Manawatu-Whanganui One Plan which focuses on existing intensive farming land use activities within targeted water catchments in the region.
2. The further workshop resumes following the workshop held on June 28, 2022, where participants explored the possibility of developing a risk assessment methodology as a way to assess the risk of nitrogen leaching loss from intensive farming land uses. The matters agreed to, along with agreed next steps, are set out in the Joint Witness Statement dated 28 June 2022 (the “June JWS”).
3. The purpose of the resumed workshop was for the farm system advisors to discuss and where possible agree how to assess and potentially quantify risk and how to present that in a ‘scored’ format (including whether it is qualitative or quantitative). The workshop was observed by the planning experts.
4. This expert conferencing workshop was held on 25 August 2022 in the Boardroom of the Horizons Regional Council Offices, Palmerston North with some members joining via video / teleconference.
5. The workshop was facilitated by Michelle Rush.
6. Farm system experts who attended the conference were:
 - (a) Ian McNab (IM), Manawatu-Whanganui Regional Council (**Horizons**);
 - (b) David Horne (DH) for Horizons;
 - (c) Dr Anne-Maree Jolly (AJ) for Horizons;
 - (d) Andrew Barber (AB) for Potatoes New Zealand and Horticulture New Zealand;
 - (e) Gavin Marshall (GM) for Federated Farmers (by AVL);
 - (f) Dr Paul Le Miere (PL) for Federated Farmers;
 - (g) Dr Brent Clothier (BC) (Plant and Food) as an invited participant by Horizons.
7. The planning experts who observed the conference were:
 - (a) Christine Foster for Horizons;

(b) Gerard Willis for Federated Farmers.

8. Also observing the conference was:

(a) Nouman Kyamanywa, Rural Advisor, Horizons.

9. This workshop was also recorded and made available to all participants and other planners involved in the PC2 appeals process who were invited but did not make it.

CODE OF CONDUCT

10. This joint statement is prepared in accordance with section 4.7 of the Environment Court Practice Note 2014 (the “**Practice Note**”)

11. We confirm that we have read the Practice Note, and in particular Appendix 3 – Protocol for Expert Witness Conferences, and agree to abide by it.

12. The planning experts also agreed to be bound by the Practice Note.

PURPOSE AND SCOPE OF CONFERENCING

13. The purpose of expert conferencing was to continue the progress made at the first expert conference to work towards the possibility of a quantifying nitrogen loss risk, and related mitigation practices.

14. The scope of the issues covered at the conference are set out in the attached agenda, and included (at a high level):

- (a) Reflection on the parties’ review of the nitrogen risk scorecard (identified as the homework in the previous joint witness statement);
- (b) Discussion of how to determine and quantify risk for the land use factors identified in the June JWS;
- (c) Discussion of how to determine and quantify risk for the mitigation measures identified in the June JWS;
- (d) Consideration of underlying location and environment factors – whether and how they should be included in a nitrogen leaching risk assessment methodology; and
- (e) Discussion of the most appropriate way to present information about land use risk.

KEY FACTS AND ASSUMPTIONS

15. N/A

METHODOLOGIES AND STANDARDS

16. N/A

AGREED ISSUES

17. Refer to Annexure A.

DISAGREEMENT AND REASONS

18. Refer to Annexure A.

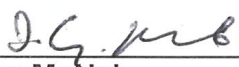
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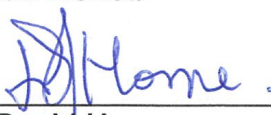
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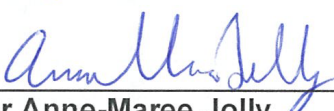
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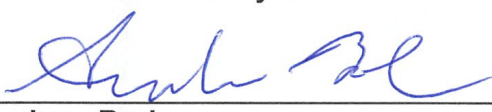
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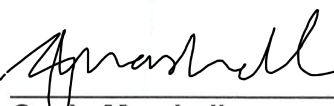
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Dr Anne-Maree Jolly



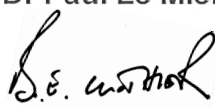
Andrew Barber



Gavin Marshall



Dr Paul Le Miere



Dr Brent Clothier

ANNEXURE A

In the matter of Proposed Plan Change 2

Expert conferencing – Intensive Farming Risk Matrix Continuation (25 August 2022)

Issue	Statements	Agreed Position	Disagreements, with reasons
Ground Rules	• Stick to the questions and make good notes • Be respectful of each other's expertise • Don't talk over each other / listen to each other • Only talking about N leaching • Intensive farming includes commercial vegetable, arable (larger than 25ha), dairy, irrigated sheep and beef [Note: BC expressed that the expertise for arable may not be in the room, should involve FAR in these discussions]		
Discussion about existing Nitrogen Risk Scorecard	• Presentation from GM • Only focusses on farm practises, not biophysical factors • Works on a points basis which is translated into a Very Low – Very High scale • What we like about it: Covers off all the risks and integrates mitigations, how it gives you a score but also sorts these into bands, has live data we can work with (Fonterra database), good benchmarking • Concerns: Defining the bands, doesn't address soil types and environmental factors, timeframes for implementation, difficult to apply to commercial vegetable production	All agreed that this concept is the starting point for what we will try and produce today (with scores leading to bands). Recognise that it is more easily applied to pastoral farming rather than commercial vegetables but it will be good to have a common approach to both types of farming.	
Topic 1 – Categorising / Quantifying Land Use Risk Factors			
Cropping and cultivation practices	See Table 1.		
Stock management	See Table 2.		

Topic 2 – Information Requirements and Assessment Against Agreed Criteria			
Agreed Criteria	As agreed in JWS dated 28 June 2022: • Certain (Unambiguous); • Consistently applied (with limited discretion); • Verifiable – able to be interrogated (transparent); • Measurability (measurable); • Able to show change in relation to a baseline; • Uses best available information (evidence-based); and • Accessible.		
Cropping and cultivation	See Table 1.		
Stock Management	See Table 2.		
Topic 3 – Categorising / Quantifying Land Use Mitigations			
Agreed Mitigations	Agreed mitigations from JWS dated 28 June 2022: • Bunding, bridges + culverts • Timing/ season/ Seasonal restriction on N application • Variable rate irrigation or nutrient application • Application rate (kgN/ha per application) • Crop selection (e.g Sheep/ Beef/ Dairy: Plantain in diet) • Wintering off pasture (stand off, housing) • Wintering off farm/ culling • Effluent management (beyond minimum requirements) – N loading effluent area, buffer distance • Water budgeting	Note: Many already covered in earlier conversations so Table 3 only covers extra mitigations not covered.	

	• Controlled traffic farming – Direct drill/Minimum till • Soil testing • Soil testing of N (before N application) (vege) • Use catch crops between vege crops • Utilising other crops in rotation (vege) • Split N fertiliser application (vege) • Develop a N balance (vege) • Use minimal tillage cultivation practices • Buffer zones within paddocks (vege) • Having a pasture phase in a commercial vege crop rotation (vege) • Land retirement • Edge of field technologies • Constructed wetlands • Point source discharge control features.		
Commercial vegetable production	See Table 3.		
Intensive pastoral farming	See Table 3.		
Topic 4 – Information Requirements and Assessment Against Agreed Criteria			
Agreed Criteria	Agreed above under Topic 2		
Commercial vegetable production	See Table 3.		
Intensive pastoral farming	See Table 3.		
Topic 5 – Underlying Location Factors			
Whether and how underlying location factors should be	PL expressed that if they are to be included in a risk assessment tool, it would have to be the same across pastoral and horticulture land uses.	All agree that underlying factors are important and should be considered but disagreement	DH and IM think it is more practical and makes more sense to include underlying factors in the scorecard

included in a nitrogen leaching risk assessment methodology	Benefits: • Build understanding of role of underlying factors in N-leaching. • All agree that it is good to understand soil texture PL and GM expressed that they would prefer to focus on practises and driving change through implementing mitigations as underlying location factors are out of the control of farmers. AB and BC also agree because they do not know how underlying factors could be included in a scorecard. DH, AJ and IM believe these factors are important and there is a lot of data to use. PL expressed that underlying factors could be taken out of the risk assessment tool but considered somewhere else in the consenting process. See Table 4.	about how they could/would be included in the scorecard concept. PL put forward option to take underlying factors out of the scorecard and consider them somewhere else in the consenting process. Some others hesitant about how this will work / how they will interact with the scorecard. In principle, all agree this is an option but need to see how it would work. All agree that there are two models that need further investigation: 1. Include underlying factors in N risk scorecard; or 2. Take underlying factors out of N risk scorecard and include as considerations somewhere else in the consenting/environment plan process.	(but don't necessarily disagree with the other approach of putting them somewhere else in consenting process). AJ agrees, wants to keep both options on the table. PL has a philosophical issue with underlying factors being in scorecard, but happy to investigate both options.
Topic 6 – Most Appropriate Way to Present Information			
Confirming what is the most appropriate way to present information about land use risk. Can it be simplified as 'scores' or 'bands of risk' or otherwise summarised in a methodology framework?		The scores and bands are not comparable between pastoral and commercial vegetable, however, format will be consistent. Bands are only indicative and give a visual indication to farmers, the important point is the scores.	BC raised potential confusion if using traffic light colours i.e. does red mean stop.

		Commercial vegetables – need to road test without prejudice with land managers – probably need Hort NZ and Potatoes NZ to do this [Need to ask whether we can do this?]	
Action Points / Notes			
• DH to set up call with IM, GM and PL to finish off imported feed factor under stock management (plus AB to report back about dung beetles) • IM to investigate plantain (report back to imported feed group) • PL to investigate constructed wetlands – NIWA response curves (report back to imported feed group) • DH to investigate bioreactors (report back to imported feed group) • AB to report back about dung beetles (report back to imported feed group) • Consider subsets for irrigated sheep and beef, and arable • Review stock management table for any gaps • DH, AJ (administrative lead), AB and GM to investigate option 1 (rough deadline: 14 September) • PL and anyone else to work with Gerard Willis and Christine Foster to investigate option 2 (rough deadline: 14 September) • Reschedule next workshop – AJ, AB and BC not available on 14 September • Follow-up with the higher ups about whether we can road test the scorecard with commercial vegetables			

Table 1: Cropping and Cultivation Practices (AJ, AB and BC)

Factor (Highest to lowest risk) Procedural Note from Facilitator: This order of factors was for workshop purposes only to enable participants to work on the big risk factors first. It should not be read as being an agreed, scientifically scored order of risk.		Information required to assess risk	Risk category / band or score [Scores are not set at this stage]	Performance against agreed criteria
N fertiliser	Applying nitrogen budget	Overseer, Landwise (most user-friendly), personal grower spreadsheet, other tools to come (aggregated to farm level)	Yes (have one) = -500 No (don't have one = (AJ scoring - see Attachment A)	Complicated process (e.g. have to do it multiple times) but yes/no score is easy to measure and certain
	Frequency of nitrogen soil testing	Commercial lab testing or Plant and Food on-farm N quick test	Scale: AJ scoring Never testing Once a year Every crop Every N fertiliser application	Meets all criteria
	Application rate	Kg/ha/year Application per year divided by number of applications	AJ scoring	Meets all criteria
	Number of applications within a single crop		AJ scoring	Meets all criteria
	Timing of application		AJ scoring	Meets all criteria
	Application methods		AJ scoring	Meets all criteria
Crop management	Number of crops within a year within a paddock (aggregated to farm level)		AJ scoring	Meets all criteria
	Property average of crop left at harvest	Annual average	AJ scoring	Really difficult – data is not there at the moment, hard to measure
	Crop residual management	Remove, cut it and leave on surface, mulch it, let stock graze it, etc.	AJ scoring	Uncertain about what the impact of that practise is but stating their practise is easy

	Management between crops	Catch crop, fallow, into another crop	AJ scoring	Data can be collected but it is difficult to measure when different practises done in different fields – don't know what effect it has on N leaching, unable to show change (more data coming in future)
	Cultivation practice	Controlled traffic or conventional – percentage area of conventional [commercial vege don't practise direct drill so crossed off]	AJ scoring	Meets all criteria
	~~Irrigation~~ Decided to exclude this factor as it is of little relevant in this area – risk is very low			

Table 2: Stock management (IM, DH, GM and PL)

Factor (Highest to lowest risk) Procedural Note from Facilitator: This order of factors was for workshop purposes only to enable participants to work on the big risk factors first. It should not be read as being an agreed, scientifically scored order of risk.		Information required to assess risk	Risk category / band or score	Performance against agreed criteria
Stock management	Stocking rate and type (includes replacement rates)	Stock units per ha [Note: DH questioned whether this directly relates to N-loss]	Same as Nitrogen Risk Scorecard (NRS)	Meets all criteria
	Dry matter eaten	Per ha	NRS	Meets all criteria
	Wintering off/culling	Monthly animal numbers Percentage x cow hours	NRS	Meets all criteria
	Wintering practises	Off pasture or on pasture x hours	NRS	Meets all criteria
Cropping and cultivation	Area (converting pasture to crop for feed)	% of effected area	NRS	Meets all criteria
	Tillage		NRS	Meets all criteria
	Season of harvest	Summer or winter Resowing?	Add some more categories [Issue about relativity? Link to stock management?]	
	When fertiliser is applied	Summer or winter	2 summer rates and 2 winter rates (amounts and season considered)	
Irrigation	Method (percentage of total area for each method)	Ha being irrigated with each method	NRS	Meets all criteria
	Scheduling method	Soil moisture tapes/budget or visual assessment	NRS	Meets all criteria
	Application method		NRS	Meets all criteria
Effluent Management	Discharge method	Storage calculator	0% = 100 points 100% = 0 points Sliding scale: 100 – percentage e.g. 90% = 10 points	Meets all criteria

	Application depth	mm	High risk soils (<10mm) = 0 pts High risk soils (>10mm) = 20 pts Low risk soils (<24mm) = 0 pts Low risk soils (>24mm) = 20 pts [GM raised issue about mixed soil types – already taken into account in storage calculator]	Meets all criteria
	Disposal area	Area per 100 cows	NRS	Meets all criteria
N Fertiliser	Total N fertiliser applied	kg	NRS	Meets all criteria
	Conversion efficiency of N fertiliser to product		NRS	Meets all criteria
	Timing of application		NRS	Meets all criteria
	~~Feed budget~~ Decided against including this factor			
	Average monthly application rates	months	NRS	Meets all criteria
Imported Feed	[In the NRS but didn't get a chance to discuss] GM, PL, IM and DH will organise a call to finish this factor within the next week (DH to set up)	[Some concern about measuring the nitrogen use efficiency from supplements – need to know how much pasture is eaten]		

Table 3: Mitigations

Factor			Risk category / band or score	Performance against agreed criteria	Information for ongoing monitoring
Pastural					
Mitigation to dry matter eaten factor under stock management	Plantain	% of diet (by mass) over summer and autumn	0 – 10% = 0 pts 10 – 20% = -10% 20 – 30% = -20% 30%+ = -30% Taken of dry matter eaten score [DH expressed a preference for 15% intervals] [IM expressed a preference for intervals of 5] [need road testing on relativity of these scores] Further work (IM)	Meets all criteria	
Edge-of-field technologies	Constructed wetlands	Percentage of pastoral area then percentage of total farm area e.g. 10ha wetland out of 100ha pastoral area = 10% x percentage of total farm area	Further work (PL) to look into NIWA response curves [AJ raised that they have to be built well to have the effect – so will use conservative numbers]	Meets all criteria	
	Bioreactors	Area drained, size	Further work (DH)	Meets all criteria	
Use of dung beetles [Note: More of a long-term mitigation]		Put in place a 4 season package	Further work (AB)	Meets all criteria	

Note: Following the conclusion of the conference, Gavin Marshall requested that the joint witness statement now record his view that the plantain and use of dung beetles factors in his opinion do not meet the criteria due to his concern of verifiability.

Commercial Vegetables (nothing new from earlier table)				
Nitrogen budget				
Soil testing				
Split fertiliser application				
Fertiliser application rate per application				
Use of catch crops				
Edge-of-field technologies (same as above)				
[Note: Discussed artificial/installed drainage and decided it did not have a big impact on nitrogen – too complex, not sophisticated enough data]				

Table 4: Biggest Influencers

Factor	Information required to be able to assess risk)	Risk categories or scores/ evidence source	Review against criteria
Critical Source Areas [All agree this is not a significant factor for N leaching]	~~Proportion of farm that is a CSA~~		
Soil type/Soil vulnerability to N leaching	Sufficient information for soil texture (S-Map, not available for all of Horizons region yet), Vulnerability index will provide helpful information (not available, but might be in the future)	Concerns of how to score and weight this. There is enough information to score it, but disagreement about how it should impact the score of a farm in comparison to on-farm practises.	
Rainfall (volume) / Sub-soil drainage (natural)			
~~Hot spots~~ [All agree these are part of the farm environment plan, not significant in N loss scorecard]	~~e.g. drain near a race, supplementary feeder units, culverts, pasture silage stack leaching~~		
[PL raised that if we are going into biophysical factors, attenuation would need to be included]			

Attachment A: Scoring from Anne-Maree (AJ)

Nitrogen Fertiliser

- Nitrogen fertiliser application rate yearly
- Nitrogen fertiliser application rate per application
- Nitrogen balance
- Timing of application
- Application methods
- Number of applications within a single crop
- Nitrogen soil testing

Nitrogen fertiliser application rate

	Points	Risk rating on report
N fertiliser: <100 kg /ha	0	
N fertiliser: 100-150 kg /ha	50	
N fertiliser: 150-200 kg /ha	100	
N fertiliser: 200-250 kg /ha	200	
N fertiliser: 250-300 kg /ha	300	
N fertiliser: 300-400 kg /ha	400	
N fertiliser: >400 kg /ha	500	

Nitrogen fertiliser application rate per application

	Points	Risk rating on report
N fertiliser: <25kg /ha	-50	
N fertiliser: 25-50 kg /ha	0	
N fertiliser: 50-75 kg /ha	50	
N fertiliser: 75-100 kg /ha	100	
N fertiliser: >100 kg /ha	150	

Nitrogen balance

	Points	Risk rating on report
Nitrogen balance: yes	-500	
Nitrogen balance: no	0	

Timing of application

	Points	Risk rating on report
N fertiliser applied Sept-April	0	
N fertiliser applied year-round < 4 winter application (May to August)	100	
N fertiliser applied year-round > 4 winter application (May to August)	200	

Application method main application

	Points	Risk rating on report
GPS banded and incorporated	-50	
GPS surface banded	-25	
Banded and incorporated	0	
Surface banded	25	
Surface broadcast and incorporated	50	
Surface broadcast	75	

Application method side application

	Points	Risk rating on report
GPS banded	-25	
Banded	25	
Broadcast	75	

Number of applications within a single crop

	Points	Risk rating on report
Base application and >3 side dressing	-150	
Base application and 2 side dressing	-100	
Base application and 1 side dressing	-50	
Base application only	0	

Nitrogen soil testing

	Points	Risk rating on report
Before every nitrogen fertiliser application	-400	
At the beginning of each crop cycle	-200	
One a year	-50	
Never	0	

Crop Management

- Cultivation practice
- Crop removal at harvest
- Crop residual management
- Number of crops within a year
- Management between crops

Cultivation practice

Cultivation practice	Points	Risk rating on report
Controlled trafficking	-25	
Conventional	50	

Crop removal at harvest

Percentage of crop removed	Points	Risk rating on report
More than 90	10	
70 to 90%	20	
50-70%	30	
25-50%	40	
Less than 25	50	

Crop residual management

Crop residual management	Points	Risk rating on report
Removed	-100	
Burnt	25	
Grazed	50	
Retained	75	

Number of crops within a year

Crops in 12 months	Points	Risk rating on report
One	0	
Two	25	
Three	50	
Four	75	

Management between crops

	Points	Risk rating on report
Catch crop wherever possible	-50	
One catch crop a year	-25	
1-month fallow	0	
2-month fallow	25	
More than 3-month fallow	50	

Mitigations

Activity	Points
Nitrogen balance: yes	-500
Application method: GPS banded and incorporated	-50
Application method: GPS surface banded	-25
Soil testing: Before every nitrogen fertiliser application	-400
Soil testing: At the beginning of each crop cycle	-200
Soil testing: One a year	-50
Residual management: Removed	-100
Catch crop wherever possible	-50
One catch crop a year	-25
Cultivation: Controlled trafficking	-25
Fertiliser applications: Base application and >3 side dressing	-150
Fertiliser applications: Base application and 2 side dressing	-100
Fertiliser applications: Base application and 1 side dressing	-50
Fertiliser application rate: N fertiliser: <25kg /ha	-50