

**IN THE ENVIRONMENT COURT
WELLINGTON REGISTRY**

**I TE KŌTI TAIAO O AOTEAROA
TE WHANGANUI-A-TARA ROHE**

UNDER	the Resource Management Act 1991
IN THE MATTER	of appeals under sch 1, cl 14(1) against the decision of Manawatū-Whanganui Regional Council on Plan Change 2 to the One Plan
BETWEEN	TE RUNANGA O RAUKAWA ENV-2021-WLG-20 NGĀTI TURANGA ENV-2021-WLG-21 ANDREW DAY ENV-2021-WLG-22 WELLINGTON FISH AND GAME COUNCIL ENV-2021-WLG-23 Appellants
AND	MANAWATŪ-WHANGANUI REGIONAL COUNCIL Respondent

**STATEMENT OF REPLY EVIDENCE OF PROFESSOR DAVID HORNE ON BEHALF OF
MANAWATŪ-WHANGANUI REGIONAL COUNCIL**

OVERSEER AND PASTORAL RISK ASSESSMENT TOOL

Dated: 13 November 2023



Cooper Rapley Lawyers
227-231 Broadway Avenue
PO Box 1945
Palmerston North
DX PP80001

S Johnston / A J R Sinclair
06 353 5210
06 356 4345
sjohnston@crlaw.co.nz

TABLE OF CONTENTS

A.	INTRODUCTION	1
B.	SCOPE	1
C.	CONTEXT	2
D.	THE NEED FOR THE ALTERNATIVE PATHWAYS	4
E.	‘NATURAL CAPITAL’	6
F.	THE RISK ASSESSMENT TOOL	8
	Reliability.....	8
	Outcomes of implementing the risk assessment tool	10
	Other matters.....	12
G.	USE OF OVERSEER	12
H.	RESPONSE TO DR MACKAY.....	14
I.	RESPONSE TO DR PARLATO.....	15
J.	FIGURES.....	18

REPLY EVIDENCE OF DAVID HORNE**A. INTRODUCTION**

- [1] My full name is David John Horne.
- [2] I prepared a statement of evidence dated 6 October 2023 (**Evidence**) on the management of nitrogen leaching from pastoral farms for Proposed Plan Change 2 to the One Plan (**PC2**), on behalf of the Manawatū-Whanganui Regional Council (**Horizons**).
- [3] My experience and qualifications are set out in my Evidence.
- [4] I repeat the confirmation given in my Evidence that I have read and will comply with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2023, and that my evidence has been prepared in compliance with that Code.

B. SCOPE

- [5] My reply evidence responds to points made in evidence by:
- (a) Dr Alec MacKay, Dr Elizabeth Parlato and Dr Alison Dewes on behalf of Fish and Game;
 - (b) Mr Gregory Carlyon on behalf of Ngāti Turanga and Fish and Game; and
 - (c) Mr Michael Scott and Mr Andrew Day on Mr Day's behalf.
- [6] As I interpret the appellants' evidence, they are mainly concerned that:
- (a) The need for the alternative pathways (initially the specified nitrogen reduction pathway, and now the risk assessment tool) has not been adequately justified;
 - (b) The 'natural capital' allocative system has not been incorporated in the PC2 provisions;

- (c) The benefits of the improved Overseer have not been fully acknowledged by Horizons;
- (d) The risk assessment tool is entirely untested; and
- (e) The risk assessment tool will not deliver the required reductions in nitrogen leaching.

[7] I have also wrestled with many of these issues. I offer a response to each of these concerns below and hope to explain why my view differs to those of my colleagues.

C. CONTEXT

[8] To begin, Mr Carlyon asserts that the “*primary driver*” of PC2 is to “*provide consents to intensive farming land use*”.¹ I consider that this is an oversimplification of what Horizons (and I) proposed at the Council level hearing, and what is still being proposed now.

[9] Plan Change 2 had, and still has, two aspects to it. First, is the need to adjust Table 14.2 to reflect the improvements that were being (continuously) incorporated into Overseer. This requirement was obvious to all and as such, uncontroversial.

[10] Second, having an additional consenting pathway available to existing unconsented IFLU farmers unable to meet their Table 14.2 CNLMs was seen as appropriate, provided this pathway did not compromise water quality. This pathway and the desired water quality outcome would be based on and realised via farmers adopting practice changes on-farm (i.e., good management practices (**GMP**) and best management practices (**BMP**)). To access the specified reduction pathway, a reduction of 20% of their baseline nitrogen leaching rate was required (for pastoral). This represented many farmers making, in all practical senses, as many practice improvements as could be reasonably expected as a precondition for resource consent.

¹ Statement of Evidence of Gregory Carlyon (6 November 2023) at 16.9.

- [11] For a smaller group of farmers, it would be all but impossible for them to reach their CNLM or the specified reduction (of 20%) and a discretionary activity consent would be required. In some cases, the most practicable future for some farms would likely be a different, less intensive land use. Also as mentioned in my Evidence, I understand that this type of land use change is enabled in PC2 through the inclusion of a transitional pathway which has not been appealed.²
- [12] At the Council level hearing I proposed, among other things, the following:
- (a) That there is a wide ranging and effective suite of GMP/BMPs that farmers could adopt to help them meet the CNLM values in Table 14.2;
 - (b) However, as a pragmatic exception to Table 14.2 for unconsented existing IFLU farmers who could not meet their CNLMs, an alternative pathway (for some farmers) would be both helpful and effective in Plan Change 2 being (the specified nitrogen reduction pathway);
 - (c) That Overseer was fit for the purpose of helping farmers identify the GMP/BMPs needed for (b) and (c); and
 - (d) That the above would foster the changes to farm management that are required to help deliver the improvements in water quality that Table 14.2 was aiming towards.
- [13] In my view, these were sensible and pragmatic recommendations, which were adopted by Horizons. I do not believe that they amount to pursuing a single goal of *“provid[ing] consents to intensive farming land use”*.
- [14] As is well known, following the Council level decision the Overseer whole model peer review report (and the Ministry for the Environment guidance following it) cast doubt on the use of Overseer as a regulatory tool. As the specified nitrogen reduction pathway directly relied on Overseer, changes to the alternative pathway were needed to respond to those reports. As I

² Statement of Evidence of David Horne (6 October 2023) at [46].

discuss in my Evidence, I was part of a group convened by Horizons to develop that alternative approach. After considerable deliberations, that expert group developed the nitrogen risk assessment tool that is now proposed.

[15] Following that work, I have revisited my recommendations for PC2, described above at [12]. Updating that list, I note that:

- (a) Intensive pastoral farms should pose a 'low risk' to water quality;
- (b) There is a wide ranging and effective suite of GMP/BMPs that farmers could adopt to help them minimize the risk they pose;
- (c) The risk assessment tool is fit for the purpose of helping farmers identify the GMP/BMPs in (b);
- (d) That the above would foster the changes to farm management that are required to deliver the improvements in water quality that Table 14.2 was aiming towards.

D. THE NEED FOR THE ALTERNATIVE PATHWAYS

[16] At the Council level hearing in 2020, DairyNZ and Federated Farmers proposed an alternative pathway for those farmers who could not practically meet their CNLM as defined by Table 14.2. They suggested that if their leaching rates was less than the 75th percentile value for nitrogen leaching, then they should reduce their leaching rate by 10%. Farms above the 75th percentile would be required to reduce their leaching rate to match this 75th percentile value, or by 10%, whichever was the greater.

[17] I accepted that an alternative pathway was appropriate. Having said this, I was also conscious of the need to drive ambitious practice change to achieve water quality improvements. Therefore, I reached the view that a 10% reduction in nitrogen leaching would not be sufficient as an alternative to farmers meeting their Table 14.2 CNLM.

[18] On the basis of the analysis that I conducted in 2020 (using a large dataset of Overseer files for farms in the targeted WMSZs held at that time by

Horizons), I came to the view that it would be reasonable to expect minimum reductions in nitrogen leaching required between 10% (as proposed by DairyNZ and Federated Farmers) and 20%.

[19] At the Council level Hearing I ultimately supported a minimum value of 20% for the following reasons:

- (a) By requiring farmers to achieve at least a 20% reduction, a greater number of them met, or came very close to meeting their CNLM – Overseer analysis that I performed as part of my s 42A reporting shows that that if farmers who exceeded their CNLM by 0 to 10–12 kgN/ha/yr introduced GMPs/BMPs necessary to close this gap, and thereby met their Table 14.2 commitments, then approximately 65 to 70% of the farmers in the region would be able to comply with the recalibrated Table 14.2.³
- (b) Dr Snelder’s modelling suggested that there would be a modest improvement in water quality in the river if farmers reduced nitrogen leaching rates by approximately 20%.⁴
- (c) It became progressively more difficult for some farmers to decrease their leaching losses after a reduction of 20%.
- (d) There was little additional improvement in water quality if the much more onerous reduction of 40% was required.⁵

[20] To address a point from Mr Scott, I disagree that the fact that 65–70% of farmers would be able to meet their CNLM with GMPs/BMPs under the recalibrated Table 14.2 means that *“there is no policy gap needing to be filled such that other controlled activity pathways are needed”*, or that including the alternative pathways *“just provides for unnecessary complexity, with*

³ Section 42A Technical Report of David Horne (4 September 2020) at 81.

⁴ Statement of Evidence of Antonius Snelder (6 October 2023) at Attachment B. See ‘Proposed pathway B’ – a reduction of 12 kgN/ha/yr for a mean relative difference value of 40.7%, compared to 44.6% for the 2012 baseline.

⁵ Statement of Evidence of Antonius Snelder (6 October 2023) at Attachment B. See ‘Proposed pathway D - a reduction of 18 kgN/ha/yr for a mean relative difference value of 40.2%.

*little gain, and high potential negative consequences for water quality and fairness between farmers”.*⁶

- [21] The key step in farmers reducing nitrogen leaching from their farms is the implementation of GMPs/BMPs. Driving this change is a matter of requiring farmers to engage with Horizons’ One Plan requirements, and undertake the work needed to get consent. As I said in my s 42A report:⁷

I consider that offering flexible pathways, founded on practices that farmers can adopt is the best way to encourage their ongoing engagement and facilitate the continuing behaviour change necessary for improving water quality well into the future.

- [22] I suggest that the alternative pathway both reduces complexity and increases equity amongst farmers. If the alternative pathway is not available, then more farmers will apply for a discretionary consent. This will be, by definition, a complex process and will be a strain on Council resources. also considered at the time that a transparent, fixed value of 20% also increases the sense of fairness.
- [23] Further, the water quality outcomes seen from allowing existing IFLU farmers access to the specified nitrogen reduction pathway (and now the risk assessment tool pathway) are sufficiently similar to requiring them to achieve the Table 14.2 CNLMs that the difference between the two approaches is not meaningful.⁸

E. ‘NATURAL CAPITAL’

- [24] The appellants’ experts characterise the alternative controlled activity pathways as a departure from the underlying natural capital approach of the One Plan, and/or ‘grandparenting’.⁹

⁶ Statement of Evidence of Michael Scott (6 November 2023) at 8.49c.

⁷ Section 42A Technical Report of David Horne (4 September 2020) at 92.

⁸ Statement of Reply Evidence of Antonius Snelder (13 November 2023) at section D.

⁹ See Statement of Evidence of Alec MacKay (6 November 2023), Statement of Evidence of Gregory Carlyon (6 November 2023) at 6.12–6.13, Statement of Evidence of Michael Scott (6 November 2023) at 4.3–4.4, Statement of Evidence of Andrew Day (6 November 2023) at 3.5.

- [25] I understand that the alternative consenting pathways have always been understood as pragmatic exceptions to the underlying approach of the One Plan, which is not under discussion. They apply only to existing unconsented IFLU in targeted WMSZs, so they are by their nature quite narrow exceptions.
- [26] However, to the extent that it is relevant to PC2, I have considered how the alternative consenting pathways reflect natural capital. While the specified nitrogen reduction pathway does require reductions from a historical baseline, the entire rationale for that pathway, and evidence for its effectiveness, was how it forced farmers to meet or go close to meeting their Table 14.2 CNLMs (which were derived using a natural capital approach). In other words, the specified reduction pathway in DV-PC2 was not disengaged from natural capital.
- [27] In relation to the risk assessment tool, a natural capital approach is one of its distinct advantages – it looks at the biophysical characteristics of the land, and says everyone must reach a low level of risk. This is the antithesis of grandparenting.
- [28] Also, in some ways, the risk assessment tool better represents the natural capital of the underlying land than the use of Land Use Capability (**LUC**) class. As Dr MacKay's s 42A report acknowledges, 'natural capital' is an abstract concept, and needs to be represented by biophysical proxies.¹⁰ The 'legume-based pasture/LUC' approach in Table 14.2 is one such proxy. It focuses on the ability of the land when unmodified to (to put it simply) produce grass.¹¹
- [29] The risk assessment tool is another proxy for natural capital, and it addresses the features of the land which affect the risk of nitrogen leaching – soil and rainfall. In this sense, it is more targeted/relevant to the nitrogen leaching issue than the 'legume-based pasture/LUC' approach, as it is concerned about the risk that these soils pose for leaching. This is a different view of natural capital; however, it is still a natural capital approach – one that is more focused on environmental outcome than production.

¹⁰ Section 42A Technical Report of David Horne (4 September 2020) at section 3.

¹¹ I would comment that its assessment of the productive capacity of the land is based on a rather outdated method (LUC).

- [30] Dr MacKay, in his s 42A report, appears to agree. At 41–42, he notes that the use of rainfall data in addition to LUC provides a more accurate picture of the contribution of each land unit to nitrogen leaching and loading in the river. Table 14.2 does not account for rainfall, while the risk assessment tool does.
- [31] Table 14.2 and the risk assessment tool are ultimately still different, and have different advantages. Table 14.2 is finer grained than the risk assessment tool (that is, it has more classes). However, it is an oversimplification to say that the risk assessment tool does not represent a natural capital approach.

F. THE RISK ASSESSMENT TOOL

Reliability

- [32] At 20.6 of her evidence, Dr Dewes says the risk assessment tool relies on “*a number of proxies on proxies*”. As I understand this criticism, Dr Dewes is pointing out that the risk assessment tool is built on multiple layers of aggregations of data. This is true – I agree that the risk assessment tool is much coarser than Overseer. But, as I note above, Horizons’ ability to use Overseer to regulate what happens on farm is presently limited, and so this type of alternative tool is needed to manage leaching risk. Also, I consider it important to note that every model is an abstraction of reality to a certain extent.
- [33] Dr Dewes also considers that the nitrogen risk assessment tool is not “*underpinned*” by best science available.¹² While it lacks the nuance of Overseer, I am of the view that the risk framework is based on the same science that Overseer is. A key point here is that the risk assessment tool is an alternative to Overseer, rather than a new approach entirely. It is different in the output numeric it produces (a risk score rather than a modelled leaching value in kg N/ha/yr), but it deliberately shares some

¹² Statement of Evidence of Alison Dewes (6 November 2023) at 20.1.

architecture with Overseer, and in terms of the adoption of GMP/BMPs it delivers similar outcomes.

- [34] To explain, at the expert conferencing of pastoral farm systems experts on 15 March 2023, I presented the PowerPoint slide attached as Figure 1 in Section K of this reply. In that slide, I have noted the similarity in architecture or structure between the two tools (compare Overseer on the left hand side of the figure with the Fonterra Nitrogen Risk Scorecard (**NRS**) on the right hand side). This is not surprising, as the key drivers of nitrogen leaching on pastoral farm are well understood.
- [35] Furthermore, as I stated in my evidence, I used Overseer to help create the matrix structure (the influence of soil and drainage as expressed as PAW and rainfall) in which the NRS is embedded.
- [36] I do want to be realistic. When using the risk assessment tool instead of Overseer, much of the underlying mathematics and complexity is lost. Overseer provides a farmer much more particularised advice around their nitrogen loss (even acknowledging the limitations, assumptions, uncertainties that exist with a model). However, importantly, in my opinion both tools deliver very similar advice to the farmer about the practice changes needed to reduce nitrogen leaching rates. This is evident in the data analysis/calibration work I outline in my Evidence.¹³ As such, in the context of regulating existing IFLUs and driving practice change on-farm, little is really lost.
- [37] Dr Dewes reminds us that in identifying the most appropriate BMP/GMPs to adopt, farmers should be conducting a detailed analysis using other decision support tools, such as Farmax.¹⁴ This is an important point, and places the comparisons between Overseer and the risk assessment tool in a broader context. I would suggest that recognising that additional tools should be used to select the most appropriate changes on farm perhaps dilutes some of the differences between the two tools. By this, I mean that a thorough analysis of GMP/BMPs (which farmers should be conducting regardless of

¹³ Statement of Evidence of David Horne (6 October 2023) at section K.

¹⁴ Statement of Evidence of Alison Dewes (6 November 2023) at 22.2–22.3.

the regulatory requirements for nitrogen leaching) involves a chain of decision tools that identify the most appropriate practices for a farm, rather than being a 'Overseer vs the risk assessment tool' discussion.

Outcomes of implementing the risk assessment tool

[38] The principal concern of the appellants appears to be that the risk assessment tool will not deliver the required reductions in nitrogen leaching – specifically, that the tool is too 'uncertain' for use in PC2.¹⁵ I would point out that:

- (a) The risk assessment tool is based on the widely used and evaluated NRS, as developed by New Zealand's largest company (Fonterra);
- (b) The architecture/structure of Overseer and the Matrix are similar;
- (c) While the two tools deliver very different output metrics, the GMP/BMPs considered by both tools are well matched;
- (d) The 2019 AbacusBio report on the NRS suggests that the agreement between components of Overseer and the NRS are surprisingly good, given that the NRS does not account for biophysical actors;¹⁶
- (e) The risk assessment tool improves on the NRS by including the most relevant biophysical factors;
- (f) The analysis that I have reported in my Evidence suggests that for a number of case study farms, both tools identify very similar GMP/BMs for adoption; and
- (g) As outlined in my Evidence, the modelling I conducted suggests that the Risk Matrix will drive nitrogen leaching losses down in a similar manner to the Overseer based Table 14.2 CNLMs.

¹⁵ Statement of Evidence of Elizabeth Parlato (6 November 2023) at 6.54; Statement of Evidence of Gregory Carlyon (6 November 2023) at 17.1; and Statement of Evidence of Michael Scott (6 November 2023) at 8.42 and 9.14.

¹⁶ Neville Jopson *Evaluation of Fonterra's N Scorecard Factors on Overseer Nitrogen Statistics* (AbacusBio Ltd, 1 November 2019).

- [39] The appellants also point out that the Risk Matrix is untested. This is fair – however, I am not sure how to respond to this criticism. I wonder how, given that we were developing an alternative tool to Overseer, we could have arrived at this point with a field tested tool. Nonetheless, one of the attractions of the NRS is that in some ways it is widely used and so has a degree of field evaluation. This is discussed further by Dr le Miere.
- [40] Mr Scott is concerned that *“[i]n departing from the “natural capital” approach, these pathways could mean that farms on more versatile soils would need to operate below their natural capacity to assimilate pollution and farms on poorer soils would be allowed to operate above their natural capacity to assimilate pollution”*.¹⁷
- [41] As stated above, the risk assessment tool does include natural capital, and it does so in a way that recognises “versatile” and “poor” soils. In this tool, versatile soils will have larger PAW values and poor soils will have smaller PAW values. Hence the decrease in target values from left to right in each rainfall band. Mr Scott’s concern may have had some merit if at the expert conferences, we had determined to use the unmodified Fonterra Nitrogen Risk Scorecard, which does not account for these biophysical factors. Instead, much of our effort went into designing the tool to avoid this issue.
- [42] Further, any farmer who thinks that they are disadvantaged by the risk assessment tool can apply under the recalibrated Table 14.2.
- [43] Mr Carlyon points out that that the risk assessment tool will require relatively similar net nitrogen loss risk across all cells in the matrix.¹⁸
- [44] This is true in the sense that all farms consented under this framework will pose a similar risk of nitrogen loss – they will all have to reach a ‘low’ level of risk. I see this as one of the main attractions of the risk tool approach. It treats all farmers equally in terms of risk (they will all have to be ‘low’ risk), as attenuated by the biophysical characteristics of the location of the farm.

¹⁷ Statement of Evidence of Michael Scott (6 November 2023) at 8.31.

¹⁸ Statement of Evidence of Gregory Carlyon (6 November 2023) at 6.12.

Other matters

- [45] Finally, Dr Dewes makes some suggestions which have merit, which I consider warrant further consideration.
- [46] As Dr Dewes points out, the risk assessment tool does not currently accommodate certain additional water quality mitigations, such as targeted retirement of land.¹⁹ I did not consider these mitigations, and the point by Dr Dewes is well made. Some of these (such as land retirement) can easily be incorporated into the tool, and I intend to work with Ms Foster to consider how this should be reflected in the PC2 provisions.
- [47] I have also considered Dr Dewes' point about the risk assessment tool's ability to account for multi-land use enterprises.²⁰ Mixed pastoral and CVG could naturally use a mix of the two risk assessment tool from PC2 (noting that only certain land uses will be IFLU requiring consent under the One Plan).
- [48] Finally, with respect to implementation. Dr Dewes suggests²¹ that the NRS (and, impliedly, the risk assessment tool) may have erroneous information entered into it and there is no way to validate this information. I do not agree, and refer to the evidence of Dr le Miere and Ms Foster in this regard.

G. USE OF OVERSEER

- [49] The appellants generally present Overseer as the best and most scientific tool available for measuring the nitrogen leaching from a particular farm. For example, Dr Dewes points out that there has been "*multiple peer reviews and ground truthing of Overseer over the past 15 years*".²² I agree with Dr Dewes' opinion that Overseer is the best model we have. I said as much in the Council level hearing, and devoted over two pages of my s 42A report to demonstrating the appropriateness of Overseer for its intended use in PC2.²³

¹⁹ Statement of Evidence of Alison Dewes (6 November 2023) at section 21.

²⁰ Statement of Evidence of Alison Dewes (6 November 2023) at section 12.

²¹ Statement of Evidence of Alison Dewes (6 November 2023) at 19.1–19.4.

²² Statement of Evidence of Alison Dewes (6 November 2023) at 20.1.

²³ Section 42A Technical Report of David Horne (7 October 2020) at 27–43.

However, this fails to address the ‘elephant in the room’ – the whole model peer review and the Government response.

- [50] As I said in my Evidence, “... *the Overseer Reports and Ministry for the Environment guidance means that Horizons needed to look to other options to assist it in regulating nitrogen loss on farms*”.²⁴ Horizons therefore required an alternative to the approach described above and the use of Overseer within its regulatory framework.
- [51] While the Overseer redevelopment project is showing promising results, my understanding is that there is still concern over the use of Overseer for deriving absolute numbers within regional plans, with advice remaining that other tools and information should also be relied on in managing nitrogen.
- [52] That being said, it remains my opinion that any alternative tool would do well to share characteristics with Overseer. This is the approach that was ultimately taken with the risk assessment tool.
- [53] I also note that PC2 has not closed the door on Overseer, with the recalibrated Table 14.2 remaining a potential option where appropriate.
- [54] For the reasons given in my Evidence and in reply above, I am of the opinion that the risk assessment tool provides a viable, and genuine, alternative to DV-PC2 and Overseer. My confidence in the risk assessment tool rests on the fact that it will identify very similar GMP/BMPs for farmers to employ to reduce nitrogen leaching as DV-PC2.
- [55] As a scientist (rather than a planner, lawyer, or regulator), I have formed the view that there are two workable options before the Court. I note that, as a scientist, I continue to support Overseer as a tool to estimate nitrogen leaching loss at a farm scale. That is not to diminish or take away from the merits of the risk tool, which I have confidence can drive the practice changes I outlined in my Evidence.

²⁴ Statement of Evidence of David Horne (6 October 2023) at [63].

H. RESPONSE TO DR MACKAY

- [56] I wish to address some of Dr MacKay's criticisms, particularly the suggestion that I argue that the One Plan focused only on practice improvements, which he takes as *"selective and potentially misleading"*.²⁵ Dr MacKay summarises that *"[t]he evidence that preceded the Environment Court's decision on the One Plan was on a far more refined analysis than simply focusing on the implementation of GMP/BMPs"*.²⁶
- [57] First, I do not consider that I have argued that the One Plan *only* focused on, or expected, farmers to make practice changes. I have always accepted that some farmers will need to use the discretionary pathway to attempt to obtain resource consent, and that some farmers will need to consider land use change given the characteristics of their underlying land.²⁷ This is broadly consistent with the underlying approach of Table 14.2.
- [58] Second, I am very happy to acknowledge the analysis that underpinned the original Table 14.2 in which Dr MacKay played a pivotal role – hence my use of Dr Mongahan's list of GMPs/BMPs. This underlying approach of setting LUC class based limits to drive adoption of these practices, acknowledging that *"that the range and cost competitiveness of mitigation options differs depending on the natural capital of land"*,²⁸ is retained in the recalibrated Table 14.2. I discuss how a similar approach is reflected in the risk assessment tool in section E above.
- [59] Third, in focusing on this intention to drive adoption of GMPs/BMPs in the PC2 alternative consenting pathways, it has not been my intention to be unhelpfully selective, to say nothing of being misleading. Rather, I have attempted to keep to the original spirit of the work of Dr Mackay and his colleagues, which I take to be:

²⁵ Statement of Evidence of Alec MacKay (6 November 2023) at 5.18.

²⁶ Statement of Evidence of Alec MacKay (6 November 2023) at 5.13.

²⁷ Section 42A Technical Report of David Horne (7 October 2020) at 74–77, Further Supplementary Section 42A Technical Report of David Horne (15 October 2020) at section E, Statement of Evidence of David Horne (6 October 2023) at [97].

²⁸ Statement of Evidence of Alec MacKay (6 November 2023) at 5.14.

- (a) A recognition that there is too much nitrogen entering rivers in the region;
- (b) That someone needs to take action to remedy this problem;
- (c) This 'someone' includes farmers; and
- (d) The 'action' will need to include a comprehensive list of options to reduce nitrogen leaching – that is, what we know as GMP/BMPs.

[60] I have confidence that PC2 will assist in driving the adoption of these practices, due in no small part to the thorough analysis outlined in the appendices to Dr MacKay's Evidence.

I. RESPONSE TO DR PARLATO

[61] I thank Dr Parlato for her attention to detail in paragraph 6.43 – 6.44. As she notes, she was kind enough to draw these issues to my attention personally. I will work with Ms Foster to ensure that Schedule X reflects the positions described in the Joint Witness statement of October 2022.

[62] Dr Parlato notes that I did not include the Mangatainoka sub-catchment in Table 2 of my Evidence. I have added the Mangatainoka data to the Table below.

Table 1: Comparing percentage reductions from DV-PC2 and Risk Matrix

Average % decrease in N leaching flux from farms		
	DV-PC2	Risk matrix
Upper Manawatu	16	13
Other Upper Manawatu	9	7
Rangitikei	1	1
West Coast Lakes and Horowhenua	5	4
Mangatainoka	14	11

[63] In my Evidence, I expressed caution about direct comparisons between metrics associated with DV-PC2 (with Overseer) and the risk assessment tool, not least of all because the numbers that the two tools produce are incommensurate. However, I also acknowledged the need to demonstrate

that the risk assessment tool would result in similar reductions in nitrogen leaching rates from farms as DV-PC2. I describe the exercise that I conducted to compare nitrogen leaching rates under DV-PC2 and the risk assessment tool at section K of my Evidence. Given the approximate nature of this comparison, it is my opinion that the agreement in Table 1 is very good.

- [64] Dr Parlato questions my use of all farms, rather than just unconsented farms. In answer to this, I reiterate my point above about my main objective and the approximate nature of this exercise. As I was endeavouring to demonstrate the similarity between the two tools, it would not matter which population of farms I modelled. I took the most pragmatic approach of using the largest data set available (all farms).
- [65] The conclusion that I drew is that whatever start point one adopts, 2012, 2020 or indeed in 2024, and whichever group of farms (consented unconsented or both), these two tools will result in the identification of similar GMP/BMPs, and hence reductions in nitrogen leaching from farms.
- [66] This was a comparative exercise, rather than an attempt to generate estimates of the reductions in nitrogen leaching from farms today. Rather, these results demonstrate the parity of the two tools. In other words, the risk assessment tool will produce similar outcomes to DV-PC2.
- [67] While I argued above that my primary aim was to demonstrate the similarity in 'direction of travel' of Overseer and the risk assessment tool, one could, as Dr Parlato has done, also interpret the reduction values that I present as indicative of the changes that might be expected in nitrogen leaching rates from the priority targeted. The question here is – 'changes from when to when?'.
- [68] At 6.23 of her Evidence, Dr Parlato states that:

Given changes (improvements) to practice since 2012, the reductions presented in Professor Horne's Table 1 are unlikely to reflect the expected reductions in nitrogen loss from unconsented IFLU farms in the target catchments resulting from implementation of the risk assessment tool.

- [69] It must be remembered that I was assessing average percentage reductions from the 2012 baseline. Use of the 2012 baseline has been consistent throughout my work with PC2. Dr le Miere's analysis of the NRS data is an indication of the likely changes 'from the current time'.
- [70] Despite the many differences between our methods, as outlined in Dr le Miere's evidence (risk score vs leaching rate, reduction from the 75th percentile verse average decrease), the broad agreement between us suggests that the adoption of GMP/BMPs going forward will result in future improvements in water quality of the scale that PC2 seeks.
- [71] As noted by Dr le Miere, the risk assessment tool makes no reference to the baseline situation. Perhaps this is another advantage of this approach. I agree with Dr le Miere that if his analysis had been against a 2012 baseline of risk scores, the actual reduction in risk score (and modelled nitrogen loss) would likely be larger given the improvements in farm practices over that time.²⁹
- [72] Finally, while I might quibble with the use of "*synthetic*" in Dr Parlato's paragraph 6.24, I share her concern about farms modelled in this manner. As I stated in my Evidence, I went to some trouble to make the farms/files that I generated realistic and credible. I noted a detailed workshop with two experts with deep familiarity of dairy farming in the priority catchments and my use of the NRS data that I had access to as an additional check.

13 November 2023

Professor David John Horne

²⁹ Statement of Reply Evidence of Paul le Miere (13 November 2023) at [8](e).

J. FIGURES

