

In the Environment Court
At Auckland

I te Kōti Taiao o Aotearoa
Ki Tāmaki Makaurau

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In the matter of the Resource Management Act 1991

And in the matter of appeals under Clause 14 of Schedule 1 of the RMA against the
decision of the Waikato Regional Council on Proposed Plan
Change 1 to the Waikato Regional Plan

Continued

**MEMORANDUM OF COUNSEL FOR WAIKATO REGIONAL COUNCIL IN RELATION
TO RULE GATEWAY TOOLS IN PLAN CHANGE 1**

25 January 2024



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Between

AUCKLAND WAIKATO & EASTERN REGION FISH AND GAME COUNCILS, BEEF + LAMB NEW ZEALAND LIMITED, CNI IWI LAND MANAGEMENT LIMITED, DAIRY NZ LIMITED, DIRECTOR-GENERAL OF CONSERVATION, FEDERATED FARMERS OF NEW ZEALAND, FONTERRA CO-OPERATIVE GROUP LTD, HAMILTON CITY COUNCIL, HORTICULTURE NEW ZEALAND, IWI OF HAURAKI, LANDCORP FARMING LIMITED, LOCHIEL FARMLANDS LIMITED, OJI FIBRE SOLUTIONS (NZ) LIMITED, PUKEKOHE VEGETABLE GROWERS ASSOCIATION, ROYAL FOREST AND BIRD PROTECTION SOCIETY OF NEW ZEALAND INCORPORATED, SOUTH WAIKATO DISTRICT COUNCIL, TAUPO DISTRICT COUNCIL, WAIKATO AND WAIPĀ RIVER IWI, WAIKATO RIVER AUTHORITY, WAIPĀ DISTRICT COUNCIL, WAIRAKEI PASTORAL LIMITED

Appellants

And

WAIKATO REGIONAL COUNCIL

Respondent

And

AUCKLAND WAIKATO FISH AND GAME COUNCIL, BATHURST RESOURCES LIMITED AND BT MINING LIMITED, BEEF + LAMB NEW ZEALAND LIMITED, CNI IWI LAND MANAGEMENT LIMITED, CONTACT ENERGY LIMITED, DAIRY NZ LIMITED, DIRECTOR-GENERAL OF CONSERVATION, FARMERS FOR POSITIVE CHANGE (F4PC), FEDERATED FARMERS OF NEW ZEALAND, FONTERRA CO-OPERATIVE GROUP LIMITED, GENESIS ENERGY LIMITED, GRAEME GLEESON, GRAHAM PINNELL, HAMILTON CITY COUNCIL, HAURAKI DISTRICT COUNCIL, HORTICULTURE NEW ZEALAND, LANDCORP FARMING LIMITED, LOCHIEL FARMLANDS LIMITED, MATAMATA-PIAKO DISTRICT COUNCIL, MIRAKA LIMITED, NEW ZEALAND DEER FARMERS' ASSOCIATION, OJI FIBRE SOLUTIONS (NZ) LIMITED, OTOROHANGA DISTRICT COUNCIL, PUKEKOHE VEGETABLE GROWERS ASSOCIATION, ROYAL FOREST AND BIRD PROTECTION SOCIETY, SOUTH WAIKATO DISTRICT COUNCIL, TAUPO DISTRICT COUNCIL, TIMBERLANDS LIMITED, WAIKATO DISTRICT COUNCIL, WAIKATO AND WAIPĀ RIVER IWI, WAIKATO RIVER AUTHORITY, WAIPĀ DISTRICT COUNCIL, WAIRAKEI PASTORAL LIMITED

Section 274 parties

MAY IT PLEASE THE COURT:**INTRODUCTION**

1. In our 15 November 2023 memorandum, and our 1 December 2023 reply submissions, we noted that Waikato Regional Council (**WRC**) had commissioned some additional work to compare Overseer-derived Nitrogen Leaching Loss Rate (**NLLR**) and Nitrogen Risk Scorecard (**NRS**) results for some farms in the Upper Waikato and Waipā River Freshwater Management Units (**FMUs**).
2. The work was commissioned by WRC on the basis that it may assist the Court in determining the Plan Change 1 (**PC1**) appeals should the Court wish to receive it, but in any event the information would be useful for the Freshwater Policy Review. When WRC presented its reply submissions on 1 December 2023, the Court confirmed that it would receive the additional information that analyses and compares Overseer NLLR and NRS results.
3. The purpose of this memorandum is to provide that information to the Court and parties. We also provide an update on Government actions and intentions in relation to resource management legislation and national directions.

ANALYSIS AND COMPARISON OF OVERSEER AND NRS OUTPUTS

4. The work comparing Overseer NLLR and NRS results was undertaken by independent farm auditors QCONZ, who provided a report to WRC. A copy of the QCONZ report is included in **Attachment A**. A spreadsheet setting out the data which supports the QCONZ report is attached to the covering email for this memorandum.
5. A key conclusion in the QCONZ report is that “The Overseer nitrogen leaching loss is weakly correlated with the Aggregate NRS Score ($r^2 = 0.23$)”.
6. WRC has also prepared a table which identifies the applicable PC1 rule for the 46 farms that are within the PC1 catchment, using both Overseer NLLR and the NRS. This is included in **Attachment B**.

7. Of the 46 farms within the PC1 catchment, 17 would be regulated by the same rule (and have the same activity status) irrespective of which gateway tool is used, and 29 would be regulated by a different rule (and have a different activity status) depending on which gateway tool is used. There are two farms that would be a restricted discretionary activity (i.e. high intensity) if Overseer NLLR is used, and a permitted activity (i.e. low intensity) if the NRS is used.

WRC POSITION ON THE GATEWAY TOOL

8. In paragraphs 5.21-5.30 of our 1 December 2023 reply submissions,¹ we set out WRC's position in relation to the gateway tool that should be used to implement the gateway thresholds, in particular whether PC1 should use the NRS, NLLR or both.
9. Putting aside the scope issues,² WRC indicated its preference for the NRS to be used as a single gateway tool in PC1. However, WRC also indicated that, if necessary to avoid a lengthy s 293 process, it would support a dual gateway approach as a matter of pragmatism.
10. It remains to be determined by the Court whether there is any procedural advantage in implementing the dual gateway approach, given that scope to add the NRS as an additional gateway tool, alongside NLLR, has been challenged by some parties.
11. In any event, WRC considers that the attached QCONZ report and table prepared by WRC brings the dual gateway approach into question. If applicants are able to pick and choose between gateway tools that are weakly correlated, and thereby select a more favourable activity status, that would diminish the effectiveness of the rule framework. WRC therefore remains of the view that the NRS should be used as a single gateway tool in PC1.

1 See also Evidence-in-Chief of Urlwyn Mark Trebilco, 26 May 2023, at [102]-[117] [[301.0468]]-[[301.0473]] and Supplementary Evidence of Urlwyn Mark Trebilco, 22 June 2023, at [18]-[23] [[301.0750]]-[[301.0752]].

2 As set out in our 1 December 2023 reply submissions, WRC will abide the Court's decision on scope issues.

**GOVERNMENT ACTIONS AND INTENTIONS IN RELATION TO RESOURCE MANAGEMENT
LEGISLATION AND NATIONAL DIRECTIONS**

- 12.** On 13 December 2023, the Minister Responsible for RMA Reform sent council Chief Executives a letter setting out Government intentions in relation to resource management legislation and certain national directions. A copy of the letter is included in **Attachment C**.
- 13.** The letter advised of Government intentions to repeal the Natural and Built Environment Act 2023 and the Spatial Planning Act 2023, review and replace the National Policy Statement for Freshwater 2020 using normal RMA processes and – to allow implementation of the revised National Policy Statement – extend the statutory deadline under the Resource Management Act 1991 (**RMA**) for notifying freshwater planning instruments by three years, from 31 December 2024 to 31 December 2027.
- 14.** Repeal of the Natural and Built Environment Act 2023 and the Spatial Planning Act 2023, and extension of the statutory deadline under the RMA for notifying freshwater planning instruments matters, were implemented through the Resource Management (Natural and Built Environment and Spatial Planning Repeal and Interim Fast-track Consenting) Act, which received Royal Assent on 22 December 2023.
- 15.** Extension of the statutory deadline for notifying freshwater planning instruments under the RMA, from 31 December 2024 to 31 December 2027, means that PC1 will likely have a longer life than previously anticipated by WRC in the PC1 Court hearing process.

NEXT STEPS

16. WRC anticipates that the Court may wish to provide the parties an opportunity to comment on the QCONZ report and this memorandum. WRC will abide any directions of the Court in this regard.

Date: 25 January 2024



M G Conway / T R Fischer
Counsel for the Respondent

ATTACHMENT A

QCONZ REPORT



Analysis and comparison of Overseer and Nitrogen Risk Scorecard outputs – Plan Change 1 Catchment

Completed by

QCONZ

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2 Executive Summary

This project was commissioned by Waikato Regional Council (WRC) to evaluate the relationship between Overseer FM model (Overseer) nitrogen loss numbers and the Fonterra Nitrogen Risk Scorecard (NRS) tool. The analysis used 50 farms. This is a relatively small number so conclusions drawn need to take this into account.

The NRS tool and Overseer model have different purposes. This also needs to be taken into account when considering the findings. Fonterra developed the NRS tool to simplify the assessment of the risk of Nitrogen (N) loss from a farm and to provide reports on farming practices and their level of N risk. The purpose of the Overseer model in relation to this study, is to model nitrogen leaching loss. In addition, it should be noted that Overseer is a long-term predictive model and the NRS is a short-term tool to analyse the previous dairy season.

To be able to compare the Overseer model and NRS tool, the Overseer N loss (kg N/ha) and the aggregate NRS Score were used to categorise farms into high-risk if they fall into the top 25% of farms for N Loss or NRS Score, low risk if they are in the bottom 30% of farms for N Loss or NRS Score, and medium risk otherwise.

The following observations can be made from the report:

- The Overseer N loss is weakly correlated with the aggregate NRS Score ($r^2 = 0.23$).
- The Overseer N loss is moderately correlated with the aggregate NRS score in the Upper Waikato catchment ($r^2 = 0.47$) and weakly correlated in the Waipa catchment ($r^2 = 0.20$).
- Overseer and the NRS used different land areas with NRS using effective area and Overseer total area. Overseer on average across the farms had a 4% larger land area with the largest individual farm being 24% larger for Overseer.
- The assumed quantity of N from feed imported to farms differed between the Overseer model and NRS tool. The NRS tool assumed farms imported 10.5kg N/ha more from feed than the Overseer model did. For one farm the NRS tool assumed the farm imported 54 kg N/ha more than the Overseer model.
- The NRS tool does not take into consideration rainfall and soil type, whereas the Overseer model does include these factors.
- Our analysis showed that the aggregate NRS Score and Overseer N loss indicated the same level of N risk (low, medium, or high) 54% of the time. The aggregate NRS score, and Overseer N loss indicated a difference in risk of one level 34% of the time (for example, where one tool classifies a farm as medium-risk while the other classifies it as low-risk). The aggregate NRS score, and Overseer N loss indicated a difference in risk of two levels 12% of the time (for example, where one tool classifies a farm as low risk while the other classifies it as high risk).

3 Introduction

The purpose of this project was to help the Waikato Regional Council (WRC) evaluate the relationship between Overseer Nitrogen (N) loss numbers and the Nitrogen Risk Scorecard (NRS) total scores based on real world examples. WRC is keen to understand the extent to which there is a consistent relationship between the Overseer model and the NRS tool e.g. high numbers using one tool are likely to reflect high numbers using the other.

The task was to provide a comparative assessment of Overseer N loss numbers and NRS total scores for a selection of 50 farms. This was done using 25 data sets for Miraka supply farms (2022/23 dairy season) mostly in the Upper Waikato catchment and 25 data sets for Open Country Dairy farms mostly in the Waipa catchment from the 2021/22 dairy season.

As part of this project NRS scores were generated for the 50 farms and then compared to the Overseer N loss numbers. Individual farms were anonymised in the assessment report. The NRS scores and Overseer N loss numbers were to be reported for all 50 farms.

QCONZ was asked to establish the relationship using statistical analysis to indicate answers to the following questions:

1. What is the strength of relationship between the Overseer numbers and NRS scores?
2. Would we expect high Overseer numbers for farms with high NRS scores and vice versa?
3. Is the relationship similar for farms in the Waipa catchment compared to farms in the Upper Waikato catchment?

4 Project Methodology

4.1 Methodology of analysis summary

The methodology of the analysis used in this project was as follows:

1. Appropriate Overseer dairy farm files were supplied by Miraka and Open Country Dairy. Miraka supplied files for 25 farms from the 2022/2023 dairy season and Open Country Dairy supplied files for 25 farms from the 2021/2022 dairy season.
2. The same farms were inputted in the NRS tool using the same farm input data and parameters as Overseer.
3. A spreadsheet of all the results obtained was collated and made available for analysis.
4. The data was analysed by a statistician with significant dairy sector experience.
5. The correlations and other results of the analysis were reviewed by the team of contributors to this project.
6. The report was written in consultation with all the contributors.

4.2 Team of contributors to the project

Reviewing the data inputs and Running the NRS tool:

Emma Lovett – QCONZ Regional Manager, Key Technical Person. Bachelor of Resource and Environmental Planning (Hons), Massey University. Certificates from Massey University in Intermediate Nutrient Management, Advanced Nutrient Management, Intermediate Farm Environmental Planning and Introduction to Greenhouse Gases.

Tash Pivot – QCONZ Regional Manager, Environmental Lead, Key Technical Person. Bachelor of Science, Waikato University. Dip Social Services, Te Wānanga o Aotearoa. Certificates from Massey University in Intermediate Nutrient Management, Advanced Nutrient Management, Intermediate Farm Environmental Planning, Advanced Soil Conservation and Introduction to Greenhouse Gases.

Craig Allen - QCONZ General Manager Certification. Bachelor of Agriculture, Massey University. Certificates from Massey University in Intermediate Nutrient Management, Advanced Nutrient Management, Intermediate Farm Environmental Planning, and Introduction to Greenhouse Gases.

Statistical Analysis

Dr. Oscar Dowson - an independent consultant with a background in statistics and optimization. He obtained his Ph.D. from the University of Auckland in 2018 where he worked on the application of multistage stochastic optimisation to the New Zealand dairy industry.

Reviewer, Report writers, oversight of project

Peter Wood - QCONZ Senior Consultant. Bachelor of Engineering (Hons), Auckland University. Certificates from Massey University in Intermediate Nutrient Management, and Advanced Nutrient Management.

Josh Wheeler – QCONZ Chief Operating Officer. Bachelor of Agriculture Massey University, Diploma in Applied Science, Postgraduate Diploma in Business Administration. Certificates from Massey University in Intermediate Nutrient Management, Advanced Nutrient Management, Intermediate Farm Environmental Planning and Introduction to Greenhouse Gases

4.3 Process for the input and review of the farm data

In order to input data into the NRS tool, time was spent with representatives from Fonterra to discuss the NRS tool in relation to data input. Fonterra provided an NRS Manual to further support the input of data.

Data from each farm Overseer file was then inputted into the NRS spreadsheet directly as a means to capture any changes / errors in data entry when comparing the data sets – there were some instances of misplaced decimal places and crops inputted into incorrect season in Overseer files, for example. It was concluded that to get a fair comparison and ensure consistency in inputs between the NRS tool and Overseer model that the data inputted into the NRS tool would be taken directly from Overseer model inputs for each farm.

The review process for data inputting that was followed was the same process QCONZ has used in prior years for all inputting data into Overseer for farms. With this project we inputted one seasons farm data into the NRS tool but didn't have previous years NRS data for the farms to be compared against. Therefore, we couldn't cross check the individual farm data and results against the farms previous seasons results to ensure any significant changes in Scores were checked and validated as we do with Overseer files. The review process did include a review of the key drivers of N-inputs including fertiliser, animal numbers, supplementary feed and crops and abnormalities were reviewed and checked. Every file was checked by the inputters (peer reviewing each other), and then another 25% for each dairy company files were re-checked by a staff member who has sound knowledge of Nutrient Management but who was not involved in the initial data entry.

4.4 Statistical analysis of data

The statistical analysis of the data for this project was to analyse and compare Overseer and the NRS outputs in the Plan Change 1 catchment¹ and this was completed as follows:

- QCONZ provided the statistician with two spreadsheets “WRC Data Entry 041223.xlsx” and “WRC Data Entry 0612023.xlsx.”

¹ Note that four farms used in the study were outside, but close to, the PC1 area (ie in the Taupo and Waihou-Piako catchments)

- To be able to compare the NRS tool and Overseer model the Overseer N loss (kg N/ha) and aggregate NRS Score were used, farms were categorised into high-risk if they fall into the top 25% of farms, low risk if they are in the bottom 30% of farms, and medium risk otherwise.
- The data was analysed by the statistician using the software Julia v1.9.3 using the GLM.jl package v1.9.0.
- A Word file was provided that captured all code and analysis outputs that came to form the basis of this report.

5 Results and Discussion

The following sections detail the results and the discussion of the results from the input of data into the NRS and the statistical comparison of the NRS with Overseer. The limitations of Overseer/NRS and the differences between the model/tool were also discussed in this section.

5.1 Data set

The dataset considered had 50 dairy farms in it. It is important to note that this is a small dataset from the perspective of statistical analysis, and care should be taken when extrapolating the results in this report to a wider selection of farms. Moreover, the farms were relatively homogeneous, with most being farms on well-drained soils in the Waipa and Upper Waikato catchments leaching 35 to 50 kg N/ha. Only five farms (10%) in the dataset leached less than 30 kg N/ha. The results may have been different if a wider cross-section of farms was used in the analysis.

5.2 Preliminary analysis

The Overseer N loss is weakly correlated with the aggregate NRS Score ($r^2 = 0.23$). In the following figure, each blue point is a single farm. If the Overseer and NRS scores were perfectly correlated, the blue points would all lie on the orange line.

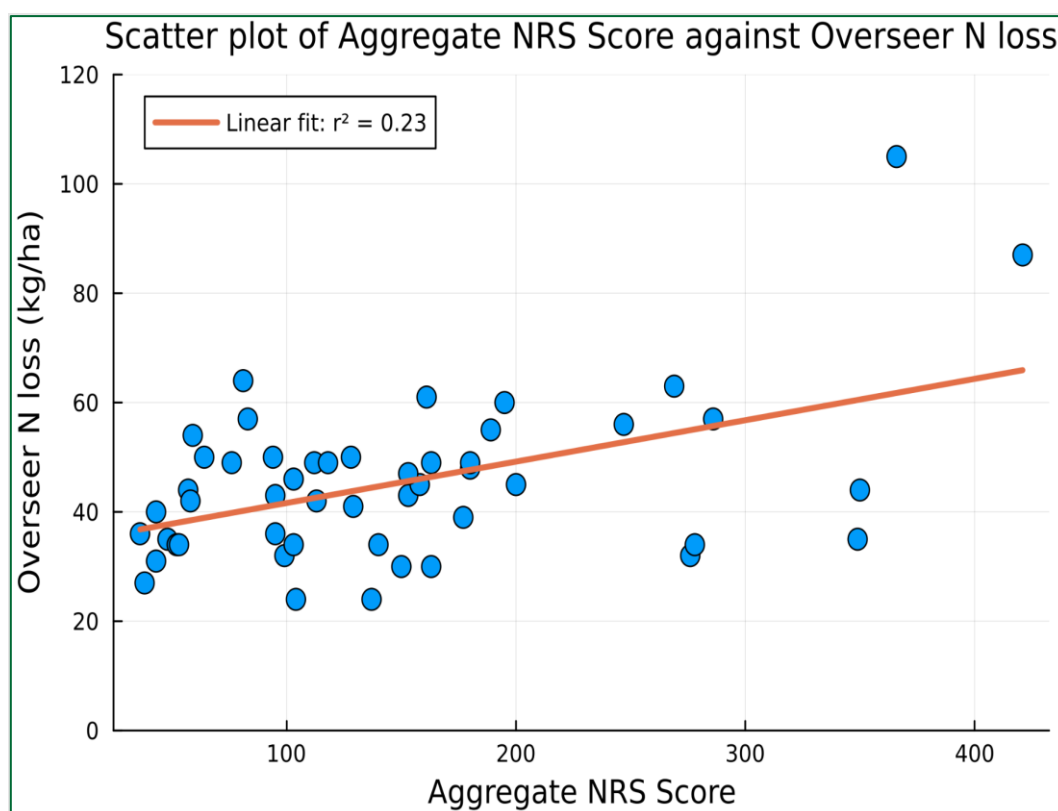


FIGURE 1: N LOSS CORRELATION BETWEEN OVERSEER AND NRS

We repeated the correlation analysis, this time breaking down the dataset into farms from the Upper Waikato and Waipa Catchments. The Overseer N loss is moderately correlated with the aggregate NRS score in the Upper Waikato catchment ($r^2 = 0.47$) and weakly correlated in the Waipa catchment ($r^2 = 0.20$). This difference is likely due to the different soil types in each catchment (See Section 5.4.4). The farms in the Waipa catchment have heavier soils than those in the Upper Waikato, and so, given the same level of input and aggregate NRS score, farms in Waipa will tend to have a lower Overseer N loss than those in the Upper Waikato.

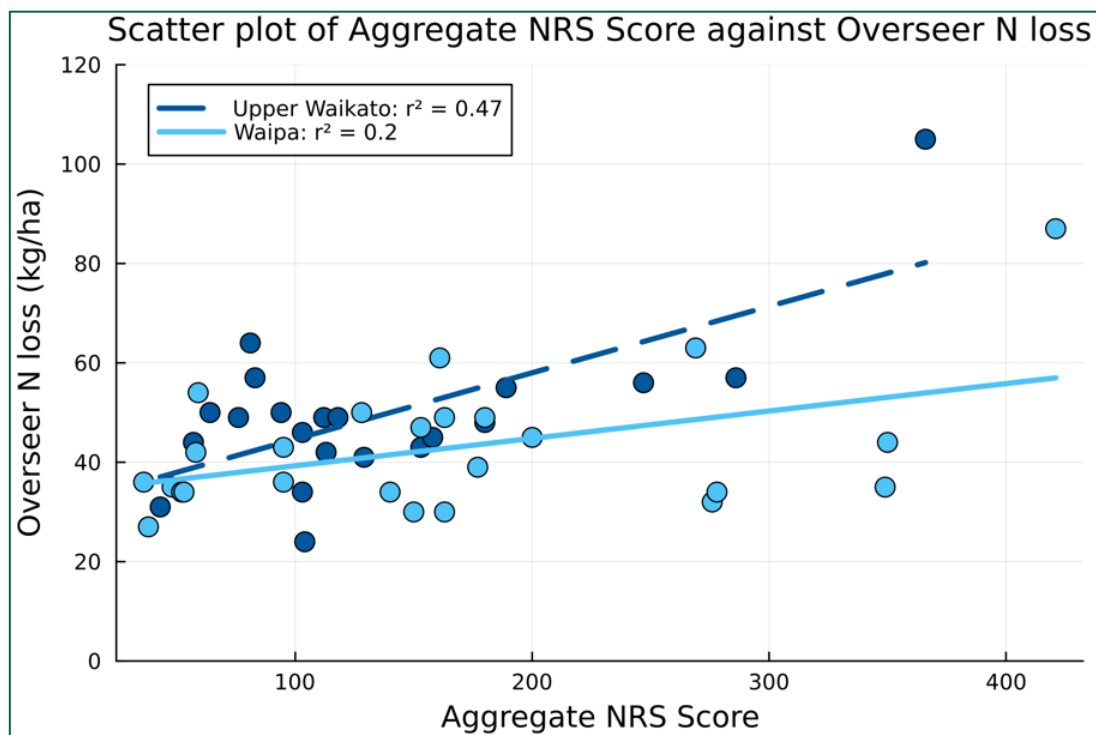


FIGURE 2: N LOSS CORRELATION BETWEEN OVERSEER AND NRS (UPPER WAIKATO AND WAIPA)

5.3 NRS Score compared to Overseer N Loss

Using the Overseer N loss (kg N/ha) and aggregate NRS Score, farms can be categorised into high-risk if they fall into the top 25% of farms for N Loss or NRS Score, low risk if they are in the bottom 30% of farms for N Loss or NRS Score, and medium risk otherwise. The following table breaks down our data set of 50 farms into each category.

TABLE 1: CATEGORISING THE NRS RESULTS VERSE OVERSEER

	NRS Low Risk	NRS Medium Risk	NRS High Risk
Overseer High Risk	3	1	7
Overseer Medium risk	7	15	2
Overseer Low Risk	5	7	3

The following figure visualizes the table. The dashed lines represent the 30th and 75th percentiles. Each farm is one point. The x-axis is the aggregate NRS score, and the y-axis is the Overseer N loss. Green points on the diagonal represent farms that were identified as low, medium, and high risk by both the NRS tool and Overseer model. Orange points represent farms where there was a difference in indicated risk of one level, for example, low risk instead of medium risk. Red points represent farms where there was a difference in indicated risk of two levels, for example, high risk instead of low risk.

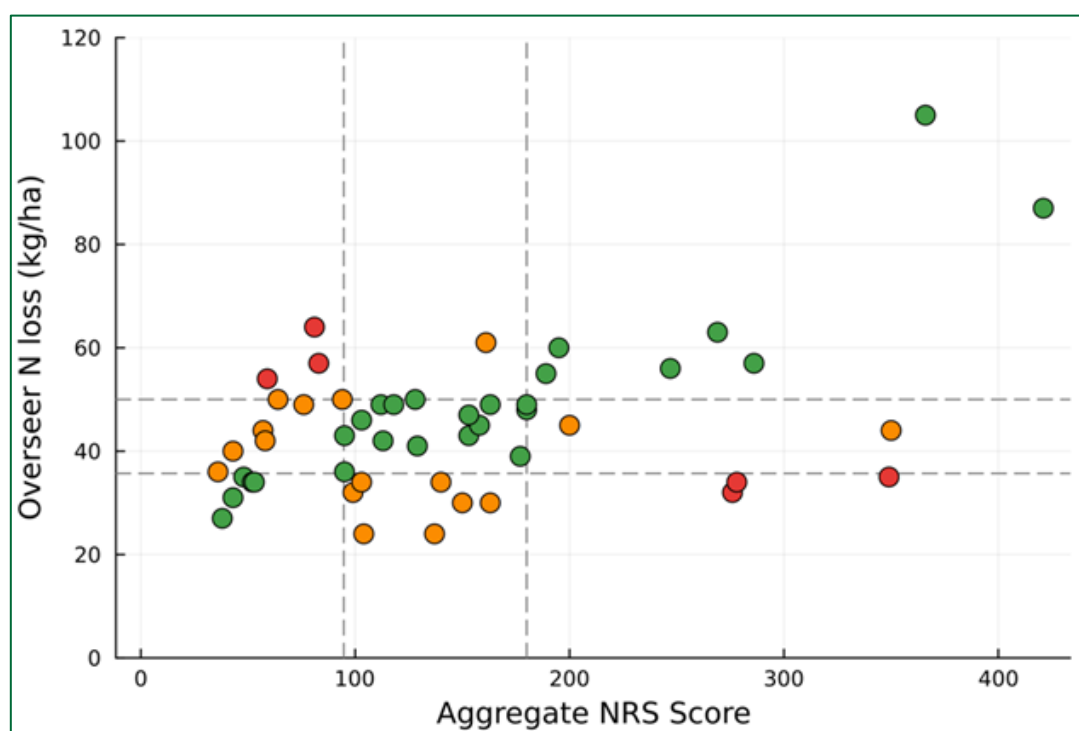


FIGURE 3 VISUALISING THE NRS COMPARISON WITH OVERSEER N LOSS VERSE NRS SCORE

The aggregate NRS score and Overseer N loss indicated the same level of N risk (low, medium or high) for 27 farms (54% of total). The aggregate NRS score and Overseer N loss indicated a difference in risk of one level for 17 farms (34% of total), for example, where one tool classifies a farm as medium-risk while the other classifies it as low risk (orange points). In the remaining six farms (12% of total), the aggregate NRS score and Overseer N loss indicated a difference in risk of two levels, for example, where one tool classifies a farm as low-risk while the other classifies it as high risk. Three of these farms (6% of total) are classified as being high-risk by NRS, but low risk by Overseer (the red points in the bottom-right). This is likely due to NRS not analysing the rainfall and soil type. Despite the different risk levels, the high aggregate NRS score indicates that they likely have high N input and are therefore good candidates for follow-up and monitoring.

The final three farms (6% of total) are classified as being low risk by the aggregate NRS score, but high risk by Overseer (the red points in the top-left). The difference may be due to differences in the data used by NRS and Overseer, but the small sample size means that more investigation is needed to properly quantify the difference in risk indicated by the two tools.

There are a few possible reasons/causes for the weak correlation and differences:

1. NRS and Overseer differences: the Aggregate NRS Score does not take into account other factors like rainfall and soil type. These factors are further discussed below.
2. Data differences: the data used for Overseer and NRS may be different. A number of differences in the data were identified that have a material impact on the analysis – these being imported feed N content and land area size used in the NRS tool and Overseer model. These differences are further discussed below.

5.3.1 Imported feed

A source of data differences between the NRS tool and Overseer is the assumed quantity of N from feed imported onto the farm. A plot of the quantity of N from imported feed assumed by NRS and Overseer is shown in Figure 4. The NRS assumed farms imported 10.5 kg N/ha more from feed than Overseer did. In the worst case, the NRS assumed a farm imported 54 kg N/ha more than the same farm in Overseer.

In Figure 4, each farm is a blue point. If the same data were used, the blue points would lie on the dashed diagonal. Points below the line indicate that Overseer assumed a lower quantity of imported N compared with NRS.

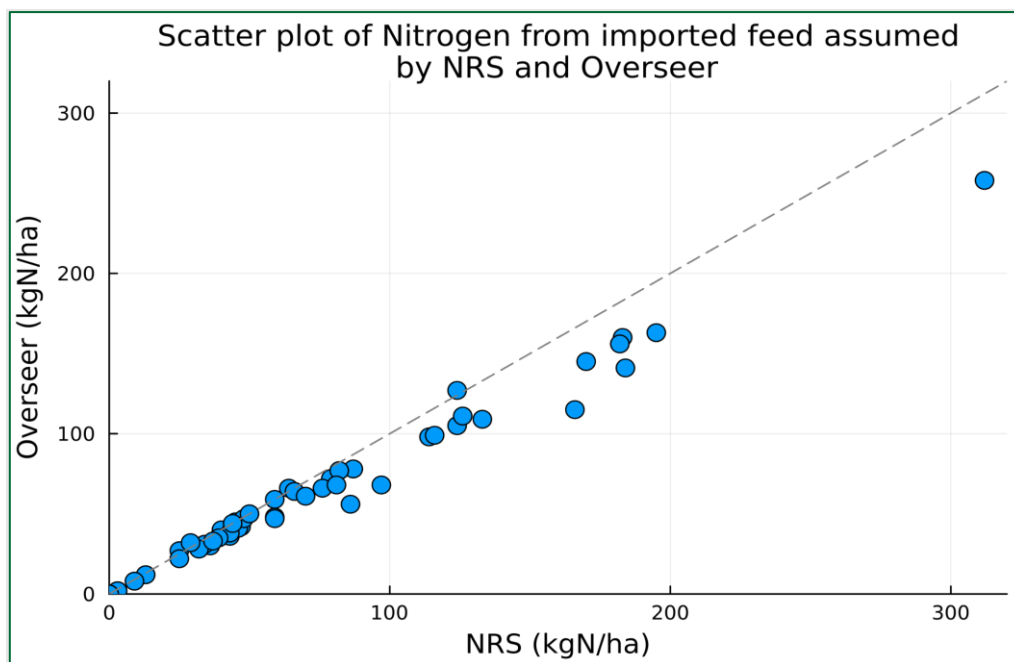


FIGURE 4: IMPORTED FEED CORRELATION BETWEEN OVERSEER AND NRS

In theory, this is a fixed data input that should be identical in both the Overseer and NRS reports. The value should be computed by taking the total quantity of feed imported, multiplying it by the N percentage of each feed, and dividing by the total area. A likely discrepancy was identified in the N percentage of various feeds assumed by the Overseer model and NRS tool. This leads Overseer to estimate N losses as lower relative to the NRS. More investigation needs to be done to work out which feeds in the NRS tool and Overseer model differ in feed N concentration. Once this is done then industry should agree on what is the correct concentration of N for all feeds so the NRS tool and Overseer model can be consistent for this input.

5.3.2 Land area

A second source of the discrepancy in the data is the difference in how the land area is treated (Figure 5). The NRS divides total N usage across the effective area of the farm, whereas Overseer divides total N loss across the total area of the farm. This can cause significant differences in farms with large ineffective areas (such as bush blocks), because this will lower their Overseer N loss value relative to the NRS scores. This further leads Overseer to underestimate N loss relative to the NRS.

On average, the total area (Overseer) of the farms considered was 4% larger than the effective area (NRS), and the largest difference was one farm in which the total area was 24% larger than the effective area. In the original dataset, NRS scores were computed using the effective area. Each farm was re-scored using the total area to assess the impact of the land area difference. On average, the modified scores were 9.2 points lower after adjusting for area, with the biggest difference being 84 points lower after adjustment. Therefore, if both the NRS tool and Overseer model are to be used in the same Catchment there would need to be consistency regarding what is the measure of total land i.e. either effective area or total area.

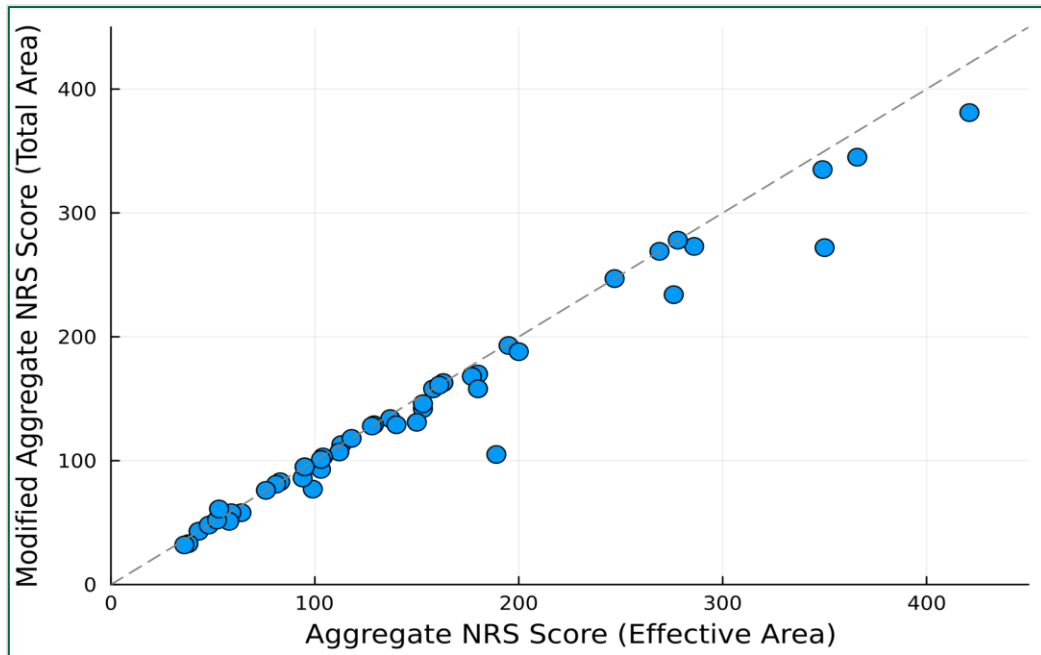


FIGURE 5: FARM AREA CORRELATION BETWEEN TOTAL AND EFFECTIVE FOR NRS

5.3.3 Rainfall

A third source of the discrepancy between NRS tool and Overseer is the quantity of rainfall. This is important because the NRS scores do not account for rainfall, whereas the Overseer model does, and higher rainfall leads to a greater risk of N loss.

Figure 6 shows the variation in rainfall across the 50 farms.

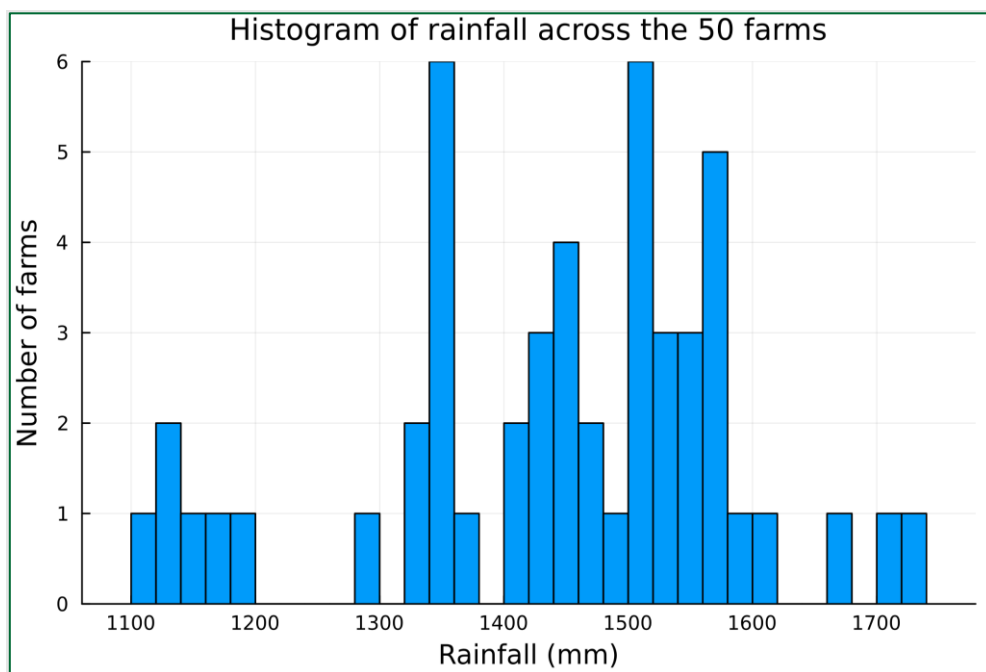


FIGURE 6: HISTOGRAM GRAPH OF RAINFALL ACROSS 50 FARMS

5.3.4 Soil type

A fourth source of difference between the NRS tool and Overseer model is the soil type. For this project each farm was categorised into “Well Drained,” “Moderate,” and “Poorly Drained” soils from the farm’s S-Map soil classification. This was done to make analysis easier. The NRS does not consider soil type, therefore, NRS will rate a farm with poorly drained soils and a high surplus N value as high-risk, even if Overseer may estimate a low level of leaching. This is an important point and potentially the main variation between the two systems, along with rainfall.

In many cases, the catchment is a proxy for the soil type. However, one challenge faced is that there was limited data to analyse, including only two farms for each of Waihou Piako and Taupo (both well drained), and only three moderate and five poorly drained farms, all of which are in the Waipa catchment, as noted in Table 2.

TABLE 2: SUMMARY OF SOIL DRAINAGE BY CATCHMENT

	Waipa	Upper Waikato	Waihou Piako	Taupo	Total
Well Drained	17	21	2	2	42
Moderate	3				3
Poorly Drained	5				5
Total	25	21	2	2	50

5.4 NRS recommendations

A key strength of the NRS is that it provides actionable insight for farmers across multiple farm management areas (Figure 7). For example, NRS breaks down risk into six farm management categories, and independently assigns a score corresponding to low, medium, and high risk of N loss. A breakdown of the number of farms by category and risk is shown in Figure 7.

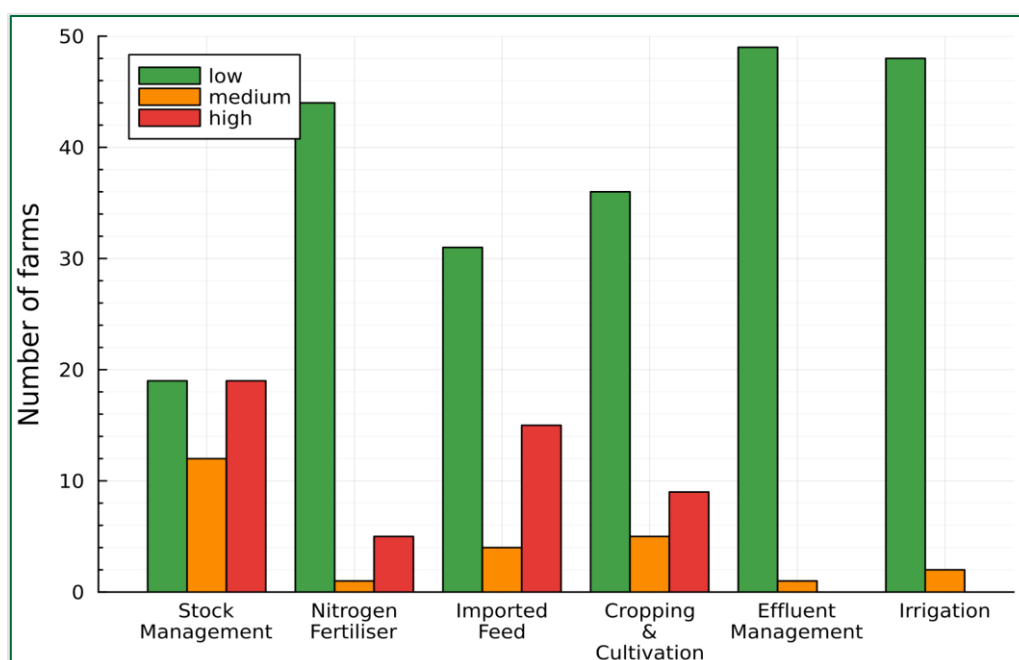


FIGURE 7: NRS BREAKDOWN OF N-RISK ACROSS THE NRS CATEGORIES

The two biggest areas for improvement for reducing N loss in the farms in the data set are *stock management* (19 farms are high risk) and *imported feed* (15 farms are high risk). There is potential to use the NRS tool for benchmarking of farmers based on their NRS score. This would then have the potential to focus farmers on areas where reductions in N risk on farm would reduce N loss. Changes from year to year in farm NRS scores will also be able to be monitored very easily through the NRS tool.

5.5 Farm Data Quality

Irrespective of the tool/model being used the quality of the data provided by farmers is important to the resulting output of both the Overseer model and the NRS tool. It was noted that some of the farm source data used for inputting into the Overseer model and then the NRS tool required a lot of interpretation. Therefore, for the purpose of this project the data for inputting into the NRS tool was taken from the Overseer model where the inputter had already interpreted the farmer supplied data.

6 Answers to project questions and conclusions

1. What is the strength of the relationship between the Overseer numbers and NRS scores?

The raw data is weakly correlated ($r^2 = 0.23$). (The r^2 is a number between 0 and 1. If it is 0, the data is not correlated. If it is 1, the data is perfectly correlated.)

The weak correlation is because of a mismatch in the data used by the NRS reports and by Overseer (N content of imported feed and land area size), and because NRS does not account for factors like annual rainfall and soil type.

With some statistical modelling, it was possible to modify the aggregate NRS scores to better predict the Overseer N loss (ref section 7.2). This increased the strength of the relationship to moderately correlated ($r^2 = 0.50$). The exact values should be viewed with caution because of the limited size of the data set, but the process could be repeated with a larger data set.

Our analysis showed that the aggregate NRS Score and Overseer N loss indicated the same level of N risk (low, medium, or high) 54% of the time. The aggregate NRS score and Overseer N loss indicated a difference in risk of one level 34% of the time (for example, where one tool classifies a farm as medium-risk while the other classifies it as low-risk). The aggregate NRS score and Overseer N loss indicated a difference in risk of two levels 12% of the time (for example, where one tool classifies a farm as low-risk while the other classifies it as high risk).

2. Would we expect high Overseer numbers for farms with high NRS scores and vice versa?

Yes. Although NRS tool does not account for rainfall and soil type, so NRS scores may be higher than Overseer would predict, especially when soils are poorly drained.

3. Is the relationship similar for farms in the Waipa catchment compared to farms in the Upper Waikato catchment?

The correlation is not uniform across catchments. The raw data is moderately correlated in the Upper Waikato catchment ($r^2 = 0.47$) and weakly correlated in the Waipa catchment ($r^2 = 0.20$).

The difference is largely because farms in the Waipa catchment had lower N leaching losses than farms with similar aggregate NRS scores in other catchments. One explanation for this is the difference in soil type between catchments. Waipa was the only catchment in our data set that had farms with moderately or poorly drained soils, and we would expect that, for the same level of N input, farms with poorly draining soils would have a lower level of N leaching.

4. Potential for the use of the NRS tool and Overseer model

Both the Overseer model and NRS tools can indicate which farms represent a low, medium or high risk of N loss. Both tools can therefore be useful for establishing regional plan rule thresholds based on this risk and can help farmers to reduce N loss. The NRS tool can be particularly useful in helping farmers understand which of their practices particularly influence the risk of N loss, and clearly shows where they need to focus to reduce N. Regular use of the NRS tool can indicate whether N loss risk is reducing over time. Overseer is a more comprehensive model that takes into account factors such as soils and rainfall. Farm management for high-risk farms may therefore benefit from use of the Overseer model as well as, or in place of, the NRS tool.

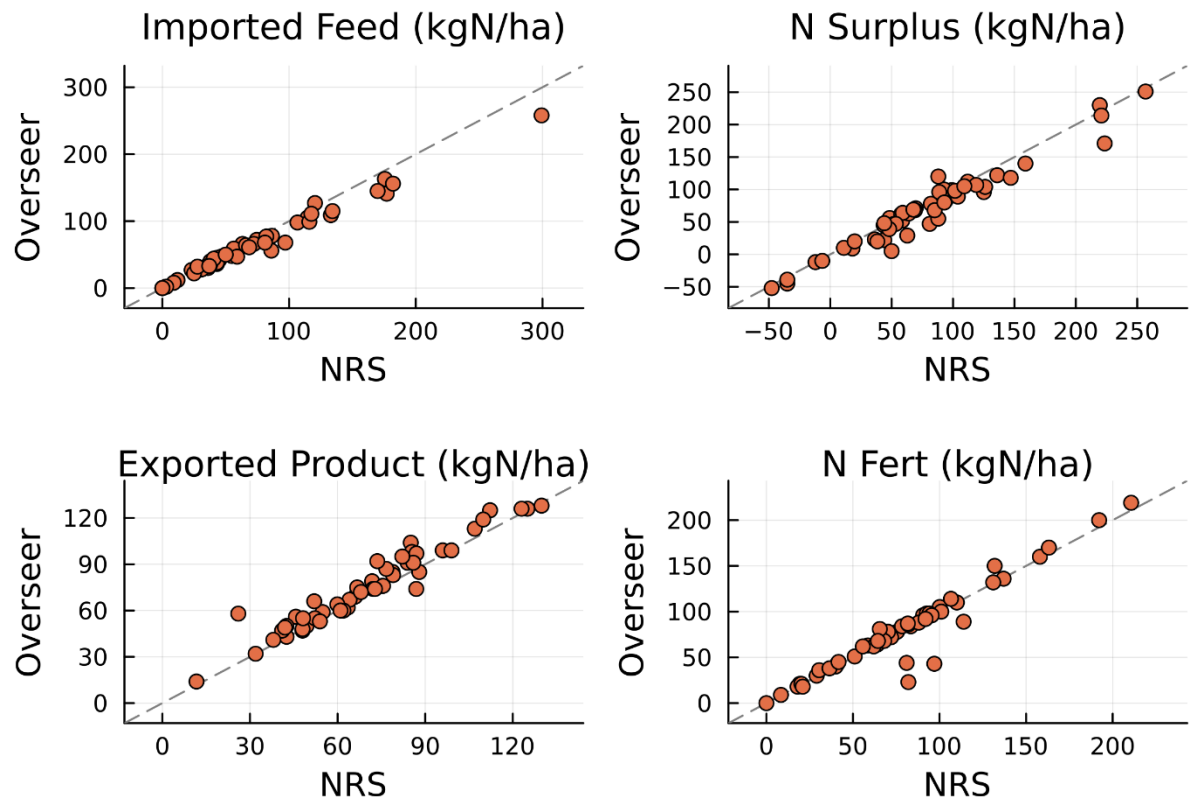
Any improvements farmers make to reducing NRS scores or Overseer N loss values should also lead to reduced N loss. Both the NRS tool and Overseer model can be used to change farmer behaviour to drive reduction in N use on most farms.

5. Other Considerations

1. The Overseer model and the NRS tool could be better aligned if there was agreement on imported feed N concentrations used in both systems.
2. Alignment between the total farm area being used by NRS and Overseer to being either “effective area” or “total area” would improve the consistency of results.

7 Appendices

7.1 Correlations for inputs and outputs



7.2 Linear model using NRS data to predict N-loss

To better align the NRS scores with the N leaching reported by Overseer, a linear model using NRS data to predict N loss was applied. A number of different models were tested. The regressors used were as follows:

1. The Aggregate NRS Score
2. The difference in N (kg N/ha) from feed imported assumed by NRS and Overseer
3. The annual rainfall (mm/year)
4. The catchment

If Overseer and NRS used identical data inputs for the imported feed, then the `feed_diff` term would be zero, and the model would be equivalent if it is ignored. Thus, this term was only added to correct the inconsistencies in the current dataset, not because it is required in the long-term.

Other factors, such as the NRS N surplus (kg/ha) and the soil type were not found to be predictive. Based on scientific understanding, the soil type should be predictive, but the project likely has insufficient data to prove this. Because Waipa had the only farm with a soil type other than well drained, it is likely that the catchment term in the model is a correlate for the soil type. It would be of interest to repeat this analysis with a larger and more diverse data set.

Our final model is:

```
overseer score ~ 1 + nrs_score + feed_diff + rainfall + catchment
```

Coefficients:

	Coef.	Std. Error	t	Pr(> t)	Lower 95%	Upper 95%
(Intercept)	5.02412	17.3981	0.29	0.7741	-30.0625	40.1107
nrs_score	0.126208	0.0236553	5.34	<1e-05	0.0785026	0.173914
feed_diff	-0.328828	0.15583	-2.11	0.0407	-0.643088	-0.0145678
rainfall	0.0270437	0.0110595	2.45	0.0186	0.00474014	0.0493473
catchment: Upper Waikato	-8.88068	8.60279	-1.03	0.3077	-26.2299	8.4685
catchment: Waihou Piako	-27.337	11.4992	-2.38	0.0220	-50.5273	-4.14668
catchment: Waipa	-16.0503	8.38336	-1.91	0.0622	-32.9569	0.8564

This should be interpreted as:

Predicted N loss (kg/ha) =

5.024 +
 + 0.126 * (Aggregate NRS Score)
 + -0.329 * (NRS Imported Feed - Overseer Imported Feed in kg N/ha)
 + 0.027 * (annual rainfall in mm)
 + (-8.881 if farm is in Upper Waikato)
 + (-27.337 if farm is in Waihou Piako)
 + (-16.050 if farm is in Waipa)

Predicted N loss (kg/ha) =

[linear model improved by rainfall]
 0.126 * (Aggregate NRS Score)
 + 0.027 * (annual rainfall in mm)
[imported feed adjustment]
 + -0.329 * (NRS Imported Feed - Overseer Imported Feed in kg N/ha)
[catchment adjustment]

- + (5.024 if farm is in Taupo)
- + (-3.857 if farm is in Upper Waikato)
- + (-22.313 if farm is in Waihou Piako)
- + (-11.026 if farm is in Waipa)

The predicted N loss is moderately correlated with the Overseer N loss ($r^2 = 0.50$). This is significantly better than our original fit of ($r^2 = 0.23$).

The improved fit is most apparent when comparing a scatter plot of the predicted N loss against Overseer N loss to the original plot at the top of this report.

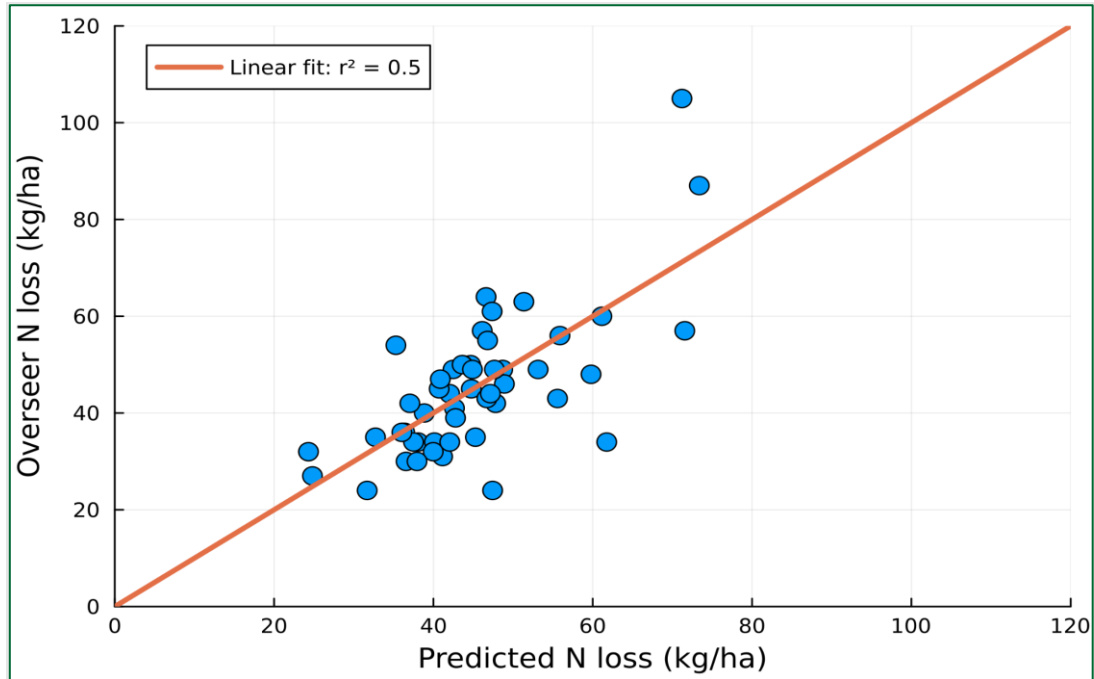


FIGURE 8: CORRELATION BETWEEN N LOSS FOR OVERSEER AND PREDICTED NRS TOOL

ATTACHMENT B

WRC TABLE COMPARING APPLICABLE RULES AND ACTIVITY STATUS

Assessment of consistency of the Nitrogen Risk Scorecard (NRS) and Overseer gateways for PC1

The following table identifies where a dairy farm would be regulated by the same rule, irrespective of whether the NRS or Overseer gateway is used, or whether the rule would be different depending on which gateway is used. The table is based on the Excel spreadsheet attached to the QCONZ comparative assessment of the two gateway tools.

The following bullets describe, the main cases when dairy farming may be a permitted activity, controlled activity or restricted discretionary activity under Rules 3.11.4.3(3A)(ii), 3.11.4.4(4A)(ii) and 3.11.4.7A³.

- In the Upper Waikato River FMU, a dairy farm may be a permitted activity under Rule 3.11.4.3(3A)(ii) if the NRS is ≤ 111 or the Overseer number is ≤ 31
- In the Waipa River FMU, a dairy farm may be a permitted activity under Rule 3.11.4.3(3A)(ii) if the NRS is ≤ 123 or the Overseer number is ≤ 30
- In the Upper Waikato River FMU, a dairy farm may be a controlled activity under Rule 3.11.4.4(4A)(ii) if the NRS is > 111 and < 233 , or the Overseer number is > 31 and ≤ 57
- In the Waipa River FMU, a dairy farm may be a controlled activity under Rule 3.11.4.4(4A)(ii) if the NRS is > 123 and < 233 , or the Overseer number is > 30 and ≤ 43
- In the Upper Waikato River FMU, a dairy farm may be a restricted discretionary activity under Rule 3.11.4.7A if the NRS is ≥ 233 , or the Overseer number is > 57
- In the Waipa River FMU, a dairy farm may be a restricted discretionary activity under Rule 3.11.4.7A if the NRS is ≥ 233 , or the Overseer number is > 43

Note that in the following table, four farms are not in the PC1 area so are highlighted in yellow and marked Not Applicable (NA) for this analysis.

The third and fourth column show the Overseer and NRS score respectively for each farm. These columns also show which rule each farm would be regulated by for each gateway using the following code: PA (Permitted Activity Rule 3.11.4.3) CA (Controlled Activity Rule 3.11.4.4) and RDA (Restricted Discretionary Activity Rule 3.11.4.7A).

Of the 46 applicable farms, 17 would be regulated by the same rule irrespective of which gateway is used and 29 would be regulated by a different rule depending on which gateway is used. Two farms (highlighted in blue) would be either a permitted activity or a restricted discretionary activity, depending on which gateway is used.

Farm number	Catchment	Overseer N loss (kg/ha) and rule code	NRS aggregate score and rule code	Overseer/NRS gateway into same rule?
1	Waihou Piako	32 NA	99 NA	NA
2	Upper Waikato	57 CA	83 PA	No
3	Waihou Piako	24 NA	137 NA	NA
4	Upper Waikato	64 RDA	81 PA	No

³ Rule 3.11.4.3(3B) and Rule 3.11.4.4(4B) provide other avenues into these rules which are not included in this analysis.

Farm number	Catchment	Overseer N loss (kg/ha) and rule code	NRS aggregate score and rule code	Overseer/NRS gateway into same rule?
5	Upper Waikato	44 CA	57 PA	No
6	Upper Waikato	50 CA	94 PA	No
7	Upper Waikato	42 CA	113 CA	Yes
8	Upper Waikato	49 CA	112 CA	Yes
9	Upper Waikato	43 CA	153 CA	Yes
10	Upper Waikato	46 CA	103 PA	No
11	Upper Waikato	55 CA	189 CA	Yes
12	Upper Waikato	105 RDA	366 RDA	Yes
13	Upper Waikato	24 PA	104 PA	Yes
14	Taupo	60 NA	195 NA	NA
15	Upper Waikato	57 CA	286 RDA	No
16	Upper Waikato	31 PA	43 PA	Yes
17	Upper Waikato	45 CA	158 CA	Yes
18	Upper Waikato	34 CA	103 PA	No
19	Upper Waikato	50 CA	64 PA	No
20	Upper Waikato	48 CA	180 CA	Yes
21	Upper Waikato	49 CA	76 PA	No
22	Upper Waikato	49 CA	118 CA	Yes
23	Upper Waikato	56 CA	247 RDA	No
24	Taupo	40 NA	43 NA	NA
25	Upper Waikato	41 CA	129 CA	Yes
26	Waipa	50 RDA	128 CA	No
27	Waipa	27 PA	38 PA	Yes
28	Waipa	35 CA	48 PA	No
29	Waipa	34 CA	140 CA	Yes
30	Waipa	87 RDA	421 RDA	Yes
31	Waipa	45 RDA	200 CA	No
32	Waipa	43 CA	95 PA	No
33	Waipa	63 RDA	269 RDA	Yes
34	Waipa	54 RDA	59 PA	No
35	Waipa	42 CA	58 PA	No
36	Waipa	30 PA	150 CA	No
37	Waipa	35 CA	349 RDA	No
38	Waipa	32 CA	276 RDA	No
39	Waipa	49 RDA	163 CA	No
40	Waipa	34 CA	278 RDA	No
41	Waipa	44 RDA	350 RDA	Yes
42	Waipa	30 PA	163 CA	No
43	Waipa	36 CA	95 PA	No
44	Waipa	39 CA	177 CA	Yes
45	Waipa	61 RDA	161 CA	No
46	Waipa	49 RDA	180 CA	No
47	Waipa	34 CA	52 PA	No
48	Waipa	36 CA	36 PA	No
49	Waipa	34 CA	53 PA	No
50	Waipa	47 RDA	153 CA	No

ATTACHMENT C

**LETTER FROM RESPONSIBLE MINISTER REGARDING RESOURCE MANAGEMENT
LEGISLATION AND NATIONAL DIRECTIONS**



13 December 2023

Tēnā koe,

Intention to repeal the Natural and Built Environment Act 2023 and the Spatial Planning Act 2023 and replace the National Policy Statement for Freshwater 2020

It is a privilege to be able to write to you as the new Minister Responsible for RMA Reform. I look forward to meeting with you in due course.

As you may be aware, the Government has set out its commitments for its first 100 days in office. These include changes to resource management legislation.

Repeal of Natural and Built Environment Act and the Spatial Planning Act

Our first step is to repeal the Natural and Built Environment Act 2023 (NBA) and Spatial Planning Act 2023 (SPA) before Parliament rises at the end of 2023, a commitment made in the Government's coalition agreements. Once the repeal is finalised, legislation will revert to the Resource Management Act 1991 (RMA).

To avoid unnecessary disruption through the repeal, a limited number of NBA functions will be retained including the fast-track consenting process while the Government develops a replacement fast-track consenting regime. We will introduce this new regime within the first 100 days of taking office alongside other changes to make the RMA faster and easier to use.

The Government is committed to reforming the resource management system. Repealing the NBA and SPA is the first phase of this reform.

In the second phase of the reform, the Government will amend the RMA to make it easier to consent new infrastructure including renewable energy, allow farmers to farm, build more houses, and enable aquaculture and other primary industries.

The third phase of the reform will replace the RMA with new resource management laws based on the enjoyment of property rights.

The Government is committed to honouring the undertakings made by the Crown through Treaty of Waitangi settlements and other arrangements. Treaty settlement arrangements reached between iwi and the Crown will be protected through the repeal and any future resource management reform processes.

Changes to the National Policy Statement for Freshwater Management

We have also decided to review and replace the National Policy Statement for Freshwater Management 2020 (NPS-FM) in this term of Government, following normal RMA processes for national direction.

We will also use the repeal legislation mentioned above to extend the RMA's statutory deadline for notifying freshwater planning instruments to implement the NPS-FM by three years to 31 December 2027. This will allow time to replace and then implement a revised NPS-FM.

We intend to use the planned RMA amendment bill to progress changes to the application of the hierarchy of obligations contained in the Te Mana o te Wai provisions of the NPS-FM. Our intent is to clarify that consent applicants do not have to demonstrate how their individual activity adheres to the hierarchy, and to disapply the hierarchy from council consent decisions. We will undertake targeted engagement with iwi/ hapū/Māori on these matters before making final decisions.

I appreciate the expertise that local government holds and the key role you will continue to play in the resource management system. I acknowledge that over the last two years or more you may have committed significant time and resources into the broader resource management reforms.

I look forward to working with you and understanding your perspective as we move forward. Should you have any questions in the meantime, please contact RM.reform@mfe.govt.nz.

Yours sincerely,

A handwritten signature in blue ink, appearing to read 'Chris Bishop'.

Hon Chris Bishop
Minister Responsible for RMA Reform