

BEFORE THE

Canterbury Regional
Council

IN THE MATTER OF

the Environment
Canterbury (Temporary
Commissioners and
Improved Water
Management) Act 2010

AND

IN THE MATTER OF

Submission and Further
Submission on Proposed
Plan Change 3 to the
Canterbury Land and
Water Regional Plan

**STATEMENT OF EVIDENCE OF DIANA JOAN MATHERS ON BEHALF OF THE
SOUTH CANTERBURY PROVINCE OF FEDERATED FARMERS OF NEW
ZEALAND**

Dated 25 September 2015

South Canterbury Federated Farmers Inc
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Qualifications and Experience

1. My name is Diana Joan Mathers. I have a BSc in Microbiology and have completed Massey University's courses in Intermediate and Advanced Nutrient Management.
2. I have been employed as the Research Manager for Farm Systems at the Foundation for Arable Research (FAR) since January 2009. Recent, relevant areas of responsibility in this role include; management of the arable nutrient benchmarking project, using Overseer® modelling, development of the cropping good management practice list for Waikato Regional Council's "Menu of Practices to Improve Water Quality", extension of information on nutrient management practices to arable farmers, the development of the Arable Farm Environment Plan Template and the guidelines for its use and workshops with farmers to inform them of the farm environment plan process.
3. Prior to being employed by FAR I was a Senior Project Advisor for the MAF Sustainable Farming Fund (2006-2009), responsible for arable and horticultural projects. Prior to this, I was project and agricultural research manager at Heinz Watties in Hastings (1994-2006). My responsibilities included management of the spray diary system for all process crops and management of projects relating to the quality improvement of processing fruit and vegetables.
4. I am a member of the following Overseer Owners management groups: The Overseer Data Input Standards advisory group representing arable cropping systems and the Overseer Guidance Governance Board. I have also recently been invited to become a member of the Fertiliser Association's Standard Setting Group for the Nutrient Management Adviser Certification Programme as the arable advisor.
5. I am the recipient of the 2015 New Zealand Institute of Agricultural & Horticultural Science (NZIAHS) - AgMARDT (Agricultural and Marketing Research and Development Trust) Technology Transfer Award for my work on nutrient management and farm environment plans with arable famers.

Code of Conduct

6. Notwithstanding that this is a Regional Council hearing, I have read the Environment

Court Code of Conduct for expert witnesses and agree to comply with it. I confirm that I have not omitted to consider materials or facts known to me that might alter or detract from the opinions I have expressed.

Background

7. The Foundation for Arable Research (FAR) is an applied research organisation responsible to New Zealand arable growers and is involved in the funding of arable and maize research and technology transfer to farmers. FAR was formed in 1995 and operates under the Commodity Levies Act, and relevant Orders.
8. An arable farm is a dynamic farm business which integrates with a number of other sectors. An arable enterprise has a number of crops grown in rotation and will often include grazing animals; sheep, cattle, deer and/or dairy cows as part of the system. Arable farmers respond quickly to market opportunities changing what they grow or graze to maintain or improve their profitability. It is important that the flexibility to be able to change or adapt farming systems in response to market opportunities is not unnecessarily constrained by environmental regulation as this can have significant adverse implications for the business sustainability of arable farming activities and regional economies.

Scope of evidence

My evidence covers the following matters:

9.
 - a. Overseer modelling of arable farms – current shortcomings
 - b. Maintaining the flexibility to change arable systems

Overseer modelling of arable farms – current shortcomings.

10. In 2012, FAR commissioned an independent review of Overseer 6 in relation to its ability to model nutrient flows in arable crops.¹ The concluding comments in the executive summary are:

“In conclusion, OVERSEER® is the best tool currently available for

¹ A peer review of Overseer in relation to modelling nutrient flows in arable crops. A report commissioned by the Foundation for Arable Research, January 2013. Attachment A.

estimating N leaching losses from the root zone across the diversity and complexity of farming systems in New Zealand. This review sets out a pathway for improving its fitness for this purpose in the arable sector (see recommendations). It also highlights that the new challenges facing OVERSEER® place demands on the development team and model owners that need to be acknowledged and resourced appropriately.”

11. The recommendations and implications for stakeholders from the peer review of Overseer are:

“• OVERSEER® is a valuable tool for managing the impact of nutrient losses from the diversity of farming systems in New Zealand and it is appropriate to continue to invest in development of OVERSEER® rather than developing a new tool.

• The rapid extension of the role of OVERSEER® has substantially changed its risk profile and the owners and users need to be aware of this. Reducing the risks resulting from the use of OVERSEER® will require governance and process changes that increase trust in its use and enhance credibility of the results it produces.

• By allowing OVERSEER® to be used in a broader policy and regulatory space the owners have implicitly accepted a responsibility to ensure that it remains fit for purpose in these new uses. This review sets out a pathway to improve its fitness for purpose in the arable sector.

• The continued development of OVERSEER® to faithfully represent arable cropping situations will take time. Managing the expectations of all stakeholder groups is probably the biggest challenge facing OVERSEER®. Strong and consistent leadership from all the groups involved in intensive annual crops, along with policy stakeholders at both national and local levels, will be required.

• Models, such as OVERSEER®, are generally better able to predict relative changes than absolute values. Regulatory authorities, and other model users, need to recognise this aspect of model application and frame their use of OVERSEER® with this in mind.”

12. The Overseer owners have endorsed these recommendations and a number of work programmes are underway to address the Review Panel recommendations. Those with particular relevance to cropping farmers include:

OVERSEER Crop Model Evaluation – funded by FAR, HortNZ and OVERSEER Management Services Ltd. The project is planned to be completed in February 2016.

An update of the OVERSEER Best Practice Data Input Standards to inform users about entering irrigation data into Overseer 6.2 – updated for use with the latest version of Overseer.

A Technical Description of OVERSEER for Regional Councils. A report prepared by AgResearch, September 2015

13. The preparation of Overseer nutrient budgets for mixed arable enterprises; those with varying crop rotations and grazing animals, is time consuming and often involves compromises in the data entry to deliver a nutrient budget for the farm.

Two common compromises in the data entry that are made are:

- i. Aggregation of similar crops to reduce the number of data entry blocks. This exercise may require fertiliser applications to be averaged and planting and harvest dates to be aligned. Farmers are accepting of this process but care must be taken to maintain the integrity of the farm system so that the Overseer output numbers are valid.
 - ii. Overseer error messages for animals being grazed on crop blocks such as those being grown for ryegrass seed or those planted with forage crops for the stock are common. The recommended solution for fixing these error messages is to reduce the forage crop yield. Accurate information about crop yield is intrinsic to the model's calculations of crop nutrient use and nutrient losses. As an example, a recent Overseer budget completed for a mixed arable farm required the forage oat yield to be reduced from 6 TDM/ha¹ to 1 TDM/ha in order to produce the nutrient budget for the farm.
14. One of the outcomes of compromises like these is that farmers lose confidence in the numbers being generated for their farms and they become disillusioned with the regulatory processes which rely on meeting the nutrient limits set in regional plans. This also has implications for the robustness of the environmental regulatory processes using Overseer modelling to set catchment nutrient load limits and measure farm performance.

15. It is unfortunate that the timeframes for the projects designed to verify, validate and improve the usability of Overseer for modelling cropping systems are out of step with the regulatory processes for setting nutrient limits in the Waitaki and South Coastal Canterbury zone. In this zone, based on my work with arable farmers, I understand farmers have concerns around the framework of limits being set, be they baselines or flexible and maximum nutrient caps, and their ongoing ability to be able to select and continue to farm enterprises that are both profitable and within the environmental limits that are being set.

Maintaining the flexibility to change arable systems

16. In the following section I provide an example of how Overseer can assist in managing nutrient discharges from arable farming properties, but also illustrate why some flexibility is important in how the Overseer tool is used. This information pertains to an existing arable business within the South Coastal Canterbury Streams zone
17. The farm is a 227 hectare mixed arable farm with irrigated deep Templeton and Mayfield silt loam soils and dry land production on shallow Rangitata soils. The farm enterprise includes a rotation of grain and seed crops, store lambs (1300) and cattle (13). The Overseer 2014-15 nutrient budget for this farm estimates a nitrogen (N) loss of 6kg N /ha/year and phosphorus (P) loss of 0.1kg P/ha/year.
18. The farm system has not altered over the past 5 years and although the farmer has not had an N baseline prepared for the farm it is a fair assumption that the N baseline value would be close to the 2014-15 Overseer estimate of 6kg N/ha/year.
19. The farm is a low emission system and the question to consider is whether a flexibility cap of 15kg N/ha/year would constrain the farmer's ability to change his system to take advantage of new opportunities.
20. Overseer modelling was completed on a scenario which looked at the introduction of carrot and potato production onto 50% of the farm area, comprising irrigated Templeton and Mayfield silt loam soils. Under this scenario, the Overseer N loss estimate for the farm increased to 9 kg/ha/year and the P losses remained unchanged at 0.1kg/ha/year. The N loss estimate for the farm is well below the

proposed flexible cap limit of 15 kg N/ha/year and the farmer would be able to diversify his system to include vegetable production.

21. A third scenario was modelled whereby the farm system was changed to 50% carrot and potato production and an additional 10% of the farm accommodating winter dairy grazing (20 cows/ha) on a kale crop supplemented with imported baleage. The cows were grazed on the lighter soil type. For this scenario the Overseer N loss estimate for the farm increased to 17 kg/ha/year and the P losses remained unchanged at 0.1 kg/ha/year.
22. The deep, silt loam soils on the majority of this farm support a range of differing arable enterprises. These and the adoption of industry good management practices, especially for irrigation, by this farmer have enabled him to minimise nutrient losses from his farm system. Although the third scenario which included dairy grazing on the lighter Rangitata soils had an N leaching loss (17 kg/ha/year) above the flexibility cap value (15 kg/ha/year), the farmer has a number of mitigation options to enable a reduction in the nitrogen loss associated with the winter grazing activity.
23. A benefit of Overseer is that enables scenario testing of farm systems under different constraints and/or opportunities. It is of interest to consider the how the nutrient losses for the above farm might change if there was a bigger proportion of lighter soil types on the farm. To examine this, Scenarios 1, 2 and 3 have been remodeled in Overseer, with the only change to the farm data being to increase the proportion of lighter soil types to 80% of the farm area. 80% of the farm area is now modelled as being a Rangitata silt loam, farm management practices are unchanged.

The following nitrogen losses were estimated by Overseer;

- i. The mixed arable system with light grazing increased from 6 kg N /ha/year to 15 kg N /ha/year
 - ii. The 50% potato/carrot scenario increased from 9 kg N /ha/year to 22 kg N /ha/year
 - iii. The 50% potato/carrot plus winter dairy grazing scenario increased from 17 kg N /ha/year to 28 kg N /ha/year
24. These scenarios demonstrate the impact that the soil type has on nitrogen losses from the farm system even when irrigation and other farm practices are being managed with good management practices. In order to maintain the productive

potential of the South Coastal Canterbury Streams' lighter soils some allowance must be made for their higher drainage potential and associated nitrogen loss when setting a nutrient loss limit.

25. I conclude that a flexibility cap is a good option for low emitting cropping systems, preserving the ability to change enterprises to maintain profitability
26. When considering the productive opportunity for lighter soil types in the zone, I support the approach taken in Proposed Plan Change 3 to base the Nitrogen Maximum Cap Limits (Table 15(n)) on soil type, with a greater discharge limit for light soils with greater propensity for drainage.
27. Based on my work with arable farmers, I understand a concern of many is a perceived lack of flexibility to be able to adjust the planned flexibility and maximum cap nutrient discharge values to match new versions of Overseer. The delivery of the Regional Council's environmental objectives will depend on farmers' commitment to following good management practices and confidence that the nutrient limits they are working towards have been set in a fair and equitable way. It will be important to build farmers' confidence in the limit system by enabling appropriate adjustments to be made to the flexibility and maximum cap values as Overseer goes through version changes.
28. A pragmatic and open approach for enabling these changes to be made would be to reset the flexibility and maximum cap values at each Overseer version change. This could be achieved by modelling a consistent set of data from an agreed reference farm system in the new Overseer version. The size of the change to the cap values is less important than their consistency with the farm values being generated under different Overseer versions.

Summary of Main Points

29. In Summary;
 - The preparation of Overseer nutrient budgets for mixed arable enterprises often involves compromises in the data entry to deliver a nutrient budget for the farm. Farmers are less likely to have confidence in their nutrient budget numbers if there have been adjustments to their farm data during the data entry process. A poor

level of confidence in Overseer nutrient loss figures works against their commitment to being able to deliver good environmental management.

- A Flexibility Cap is a good option for farms with low nutrient losses. Having room to move enables farmers to accept enterprise opportunities with the confidence that they are able to meet their environmental targets.
- Some soils in the South Coastal Canterbury Streams zone are more free-draining and have higher nutrient losses. A higher maximum cap for the nutrient loss limit should be set for these soils in order to maintain their productive capacity and economic contribution to the region.
- As the Overseer model is updated, new versions will be released and used to determine farm nutrient budgets. Nutrient loss limits set in the Regional Plan should be updated to align with the Overseer version changes. A pragmatic approach would be to have an agreed farm system which could be modelled repeatedly as the versions of Overseer were developed.

Diana Mathers

25 September 2015

Attachment A:

A peer review of OVERSEER® in relation to modelling nutrient flows in arable crops
A report commissioned by The Foundation for Arable Research
January 2013

http://www.far.org.nz/mm_uploads/FAR_OVERSEER_REVIEW_-_final.pdf