

IN THE MATTER OF the Resource Management Act 1991

AND

IN THE MATTER OF resource consent applications lodged for the water take consents in relation to the Waitaki Basin under section 120 of the Resource Management Act 1991

EVIDENCE OF MELISSA CLARE ROBSON

Introduction

1. My name is Melissa Clare Robson and I am a Senior Environmental Scientist and an Associate at Ryder Consulting Ltd. My qualifications and experience were outlined in my evidence in chief.
2. I have read the Code of Conduct for Expert Witnesses in the current (2006) Environment Court Practice Note. I agree to comply with this Code of Conduct. The evidence I am giving is within my area of expertise.

Scope of evidence

3. My evidence provides comment on:
 - (a) The evidence of the Environment Canterbury Section 42A Officer's reports, Mr Darren McNae, Ms Claire Penman, Ms Susannah Vesey, Ms Yvette Rodrigo and Dr Mike Freeman;
 - (b) The evidence of Ngai Tahu expert Mr Paul Horgan;
 - (c) The evidence of Waitaki First expert Dr Helen Brookes;
 - (d) The evidence of Fish and Game expert Ms Devon Christensen; and
 - (e) A step through guide of the proposed auditing on farms at Appendix A.

Evidence of Mr Darren McNae

Common Issues

4. A general response to the auditing undertaken by Mr McNae has been given in paragraphs 35-52 of my Right of Reply evidence for Mackenzie Water Research Limited (MWRL). To recap; the scope of the audit was narrower than the whole Farm Environmental Management Plan (FEMP) by solely focussing on the OVERSEER® modelling, in my opinion to its detriment. However, where the audit focussed on reasonable inputs into the OVERSEER® model on individual stations, this was a valid and acceptable approach. Although, many of issues raised in Mr McNae's evidence could have been answered had the FEMPs to

which to OVESEER® modelling relates to been read, or a direct approach to me made.

5. For the revised FEMPs with additional scenarios, a list of modelling assumptions and justifications were supplied as an appendix with the amended document, as were the original OVERSEER® files, to assist the auditors.
6. Where agreement has been reached through recent discussions with Mr McNae and acknowledged in his Addendum report, these issues, explanations and subsequent agreement are attached in Appendix B and only the areas that are not completely resolved are addressed in the main body of evidence.

Glen Eyrie Downs

High Impact issues

Very low clover content

7. The irrigated area will be under a rygrass, fescue, chicory and white clover sward. Clover levels are expected to be depressed due to the substantial and even return of organic manures¹ (Robson, 2009). The inorganic fertiliser application² reflects the low contribution from clover.
8. On page 4 of his Addendum evidence, Mr McNae agreed that in systems that involved high levels of organic N returned to the land, that there will be a suppression of clover. Therefore in terms of the audit, this input to the OVERSEER® model is fit for purpose. Mr McNae's outstanding point is the confirmation of these clover levels. I agree that the clover levels must and will be verified as a part of the OVERSEER® audit.

Low Impact issues and other comments

Effluent solids removed from the system

9. The removal of solids from the farm has not been modelled to ensure compliance with the NDA. Solids are separated and removed off farm to prevent applications of N to land from dairy effluent sources exceeding 200 kg/ha/yr³ (Robson, 2009).
10. On page 4 of his Addendum evidence Mr McNae accepts this explanation, however a concern remains as to the destination of this organic N if it is removed. I suggest that it is beyond the remit of Mr McNae which was after all to focus on the reasonable use of inputs to the OVERSEER® model, which he has accepted. However the issue may be of interest to the Commissioners and will therefore be addressed.
11. If the export of the organic manure is not required to meet the threshold on the farm, then there is sufficient capacity in the catchment to apply it elsewhere.
12. If the exported solids are used on another farm that is a part of these consent applications, regardless of where, the import would be recorded in their nutrient budget and its compliance assessed. If the exported solids were used on a farm

¹ Section 5.4 Glen Eyrie Downs FEMP submitted as annexure to evidence delivered on 12th October 2008

² Once the contribution from organic sources has been considered.

³ Section 5.5.4 Glen Eyrie Downs FEMP submitted as annexure to evidence delivered on 12th October 2008. 200 kg N/ha is the maximum application under permitted activity status.

that was not a part of these hearings, as long as the inorganic fertiliser applications were scaled back to account for the nutrient applied with the solids, there should be no net change in losses.

13. If the solids were imported onto a farm not part of these consent applications without discounting inorganic fertiliser applications, if they were in a catchment with little pressure on receiving environments, then there is unlikely to be any impact. However, if they are imported into an area where there is already pressure on the receiving environments, this may increase overall sub-catchment losses. However to put into context, the amount of exported manure from Glen Eyrie Downs would, using a rate of 200 kg/ha, only cover 15 ha.

WHL Killermont

14. Many of the same issues have been highlighted for WHL Killermont and Ohau Downs as for Glen Eyrie Downs and responses given from Glen Eyrie Downs apply equally for the other stations. Therefore, I shall only make responses here where they differ from those already given.

12.8t DM/ha pasture production

15. Mr McNae indicated that 12.8 t MD/ha was an issue although with no further comment. I understand that Mr McNae expanded on this aspect during his presentation and his concern was whether 12.8 t/ha DM production is sustainable. In her evidence in chief, (appendix 5) Dr Snow defends of the annual pasture production figures used in the WQS which are higher than those given here. Research published by Greenwood (1982) summarising research at Tara Hills Research station reported a range of irrigated DM production of 4.5-11.9 t/ha was possible under fertilised and irrigated conditions. However, these irrigation trials were conducted under border dyke irrigation systems with a range of return periods up to 50 days, but with an average return period of 15 days and additionally no N fertiliser was applied (Snow, 2009).
16. Although the irrigation would have increased the water holding capacity on these shallow soils, the soil's store of plant available water would soon be exhausted and the plants would spend time under moisture stress between irrigations. This results in decreased growth rates compared to the more frequent irrigation supplied by centre pivots (Snow, 2009). Modelled pasture growth rates (using EcoMod) under different irrigation return periods to represent irrigation types and soil PAW found that an average of 15 t DM/ha was modelled on the light soils such as those found on WHL Killermont Station.
17. On page 12 of his Addendum evidence Mr McNae accept Dr Snow's evidence for the purpose of the OVERSEER® audit which is the extent of his remit. Although he goes onto state that his concern is what the farmer would do in a year where pasture production was over or under this level. As has been addressed in paragraph 61 of my Reply evidence for MWRL, the level of detail of information expected by the auditors is more appropriate to OVERSEER® in a monitoring mode than the auditing of the predicted system.

Ohau Downs Station

High per cow production

18. The production per cow was given by the owner of Ohau Downs Station, Mr Zeestraten who already manages multiple dairy units in Southland, and supported by Mr Englebrecht, the farm consultant retained to provide input into

the Ohau Downs application. This, I believe, therefore constitutes a reasonable input to the model.

19. On pages 5 and 11 of his Addendum evidence, Mr McNae accepts that the basis for some production inputs were based the experience of other farming operations of Mr Zeestraten and Mr Englebrecht rather than from specific modelling. It is that specific feed modelling has not been undertaken that causes concern for Mr McNae.
20. To put this issue into context, at the higher production, modelled nutrient losses were higher than if a lower kg MS had been used in the same system. Therefore if Mr McNae's concerns were justified this would result in higher losses being predicted than would actually occur.

Killermont Station

21. There were no outstanding issues for Killermont Station.

Ms Claire Penman, Ms Susannah Vesey and Ms Yvette Rodrigo

Common Issues

22. *Paragraphs 284 and 307 of Ms Penman's evidence, paragraph 92 of Ms Vesey's evidence and paragraphs 161, 170 and 185 of Ms Rodrigo's evidence note that there are areas of concern in the OVERSEER® audit by Mr McNae pertaining to Glen Eyrie Downs/Ohau Downs, WHL Killermont and Killermont Station respectively.*
23. The majority of these issues have been addressed (Appendix A) and those outstanding ones are addressed in paragraphs 7 - 21.

Dr Mike Freeman First Addendum report

Glen Eyrie Downs

24. *Dr Freeman, in his table matching OVERSEER® assumptions with consents, queried why the solid fraction of effluent was exported.*
25. This has been addressed in paragraph 9, and is essentially to avoid over application of N to land from organic sources.

WHL Killermont

26. *Dr Freeman has highlighted that the FEMP and OVERSEER® has been modelled on 1049 ha as opposed to the 1100 ha in the application.*
27. The irrigation design on the Station covers 1049 ha, hence the input to the modelling. However, to bring the modelling into line with the application, WHL Killermont has been remodelled to 1100 ha and the FEMP updated.

Killermont Station

28. *Dr Freeman has highlighted that the 216 ha area applied for has not been included in the OVERSEER® file.*
29. The Home block and the Pebbly Flats block were modelled separately in OVERSEER® and both files submitted.

30. *Dr Freeman also indicates that the parameter report includes dairy cows.*
31. As indicated in Appendix A, the FEMP for Killermont Station states that this block is intended for a cut and carry operation and therefore the concern is not relevant.

Evidence of Mr Paul Horgan

32. *In paragraph 7 of his evidence Mr Horgan quotes from the Cultural Impact Assessment that "Ngai Tahu.....is concerned at the possible conversion to dairy. Almost without exception, the conversion over recent years of dry land farms to dairying has brought with it a host of adverse environmental effects and has resulted in the significant degradation of our rivers, lakes, streams and wetlands."*
33. It is in recognition of the potential deleterious impacts of some dairying systems that significant mitigation measures have been imposed to the dairy farming systems proposed, including extended housing and wintering off where stables are not used. Mr Horgan, while making well versed criticism of conventional dairying, does not seem to have considered that the large developments specified are all proposing extensive and expensive mitigation measures to prevent or minimise the types of damage that have come to be associated with dairy farming, in terms of degraded waterways, degraded banks, effluent pollution, soil compaction and erosion with associated P loss and winter losses of nitrate associated with urine patches.
34. *In paragraph 18 Mr Horgan states that FR is objected to because of the potential to degrade the Ahuriri delta.*
35. Ohau Downs does not drain into the Ahuriri Arm of the lake, but losses are routed through the Wairepo Arm, into the Lower Ohau Canal and into the Northern Arm. Therefore this station should not be objected to based on this condition.

Evidence of Ms Devon Christensen

36. *In paragraph 37 of her evidence Ms Christensen states that if groundwater parameters are breached then N application to land decreases and stock are withheld, and if these responses do not correct the breach a root cause analysis is carried out and then appropriate mitigation is suggested.*
37. The contingency plans read, "if groundwater analysis indicates an exceedence.....the N application to land should be reduced or stock withheld for longer until a root cause analysis can be conducted." A contingency mitigation measure is put in place while a root cause analysis is conducted.
38. *In paragraph 37, Ms Christensen goes on to express doubt as to whether the two mitigation options cited offer a sufficient suite of tools.*
39. The removal of stock and the reduction of N fertiliser are the two most effective mitigation measures for reducing N loss for a pastoral system. In this context, which is a contingency plan while a root cause analysis is conducted, a large suite of less effective measures would not be appropriate and would dilute the efficacy of the trigger- contingency plan process.
40. *In paragraph 42 Ms Christensen suggests that because changes can be made to the FEMPs, nothing in the FEMP ties the farmer into a serious commitment.*

41. Ms Christensen has misunderstood the nature of the changes permissible in the FEMPs. It is essential that FEMPs may be able to be updated and farm systems change or site specific risks arise or become obsolete, otherwise they themselves become obsolete. However, to suggest that this essential flexibility means that they do not bind the farmer to a commitment is incorrect. As stated in paragraph 138 of my Reply evidence for MWRL, the FEMPs, through their mitigation measures, monitoring and auditing plans that include triggers, contingency plans for if triggers are exceeded and actions in case of non compliance with audit measures, are not 'take it or leave it' recommendations, but form an auditable part of the resource consent that is tailored to the specific farm, environmental conditions and risk and current and proposed farm practice.
42. *In paragraph 47 Ms Christensen (and Dr Brookes in paragraphs 13-29) suggests that some wording in the FEMPs does not show a commitment to addressing risks by the use of the word 'should' and that it should be replaced with the word 'shall'.*
43. These FEMPs and FERAs are not written as a series of resource consent conditions. They are aimed for use on farm by farmers. According to the Oxford English Reference Dictionary (2006) the word 'should' is used 'to express a duty, obligation or likelihood' and is a conjugation of the verb shall. As stated above these mitigation measures are not 'take it or leave it' measures and the fact that they are enforced through monitoring and auditing for compliance confirms this intent. Consequently I believe that Ms Christensen and Dr Brookes's evidence on this point has no relevance to the matter before you.

Evidence of Dr Helen Brookes

44. *In paragraphs 30-34 Dr Brookes reports that there are inconsistent management measures proposed for the management of effluent and the presence of some pivots crossing streams, suggesting that as pivots deliver effluent and some pivots cross streams that effluent must be applied to the stream.*
45. In paragraph 71 of my evidence presenting the amended FEMPs, I clearly state 'To avoid effluent application to streams, solenoid valves were originally proposed, however this has recently been superseded and now none of the centre-pivot irrigators used to irrigate the effluent will cross streams. Liquid effluent will be applied by tanker in those paddocks that have streams running through the pivot circles.'
46. *In paragraphs 35-37 Dr Brookes considers the application of the same management provisions for prevention of effluent entering a watercourse for two virtually identical effluent irrigation systems as sloppy and one which does not inspire confidence.*
47. To the contrary, if the management provisions for two similar systems, both to prevent the same outcome, on neighbouring farms, on similar soil type and with respect to comparable streams, had been very different, this would be more likely to raise a question on confidence rather than the fact that the same measures have been used

Auditing

48. To provide an example of the auditing process, I have **attached** Appendix A to illustrate a step by step process of how WHL Killermont Station would be audited.

Other matters

49. I was asked to produce estimations of permitted baseline loads. The inputs to these calculations were from the farmer indicating what their best dryland option (or no more irrigation option) would be in terms of stock, fodder crops, grain crops etc. These areas were then multiplied by attributed losses. The losses used were derived from the AgResearch OVERSEER® modelling of Ohau Downs current farm system. These calculations are crude and intended for broad brush comparisons only. However with this in mind they do provide a basis for that comparison.
50. To repeat paragraph 41 of my MWRL Reply evidence, I understand that following discussion between applicants in the Ahuriri sub-catchment it has been proposed to proceed on a "needs plus buffer" approach. The output of this is set out in the legal submissions.

Conclusion

51. The great majority of the initial issues raised during the OVERSEER® audit have been explained to the auditor and resolved. The outstanding issues have been addressed in paragraphs 7-19 above and are either beyond the remit of the audit, trying to gain a level of detail that is not realistic to the running of proposed systems or are already due to be addressed through verification of inputs to the OVERSEER® model. The OVERSEER® models are therefore, fit for purpose.
52. In paragraph 121 of my evidence in chief I concluded that "the efficacy of all management plans is to a great extent, dependent on their implementation. The principal risk of management plans is that, once written, they are not used or implemented. In this case, regardless of how technically competent a plan is, it will not be effective. Therefore a plan needs to be not only technically competent, but it needs to be implemented, monitored and impartially audited." In paragraph 49 of my rebuttal evidence, I concluded that "I believed that these FEMPs go much further than a step in the right direction...(that) they outstrip what has yet been seen in New Zealand in terms of combating both diffuse and point source pollution from farms." None of the evidence on the updated reportage has caused me to deviate from these viewpoints, and the consent conditions presented by Mr Kyle that tie these FEMPs in allowing them to be enforced are a key step to their success.
53. The steps for auditing the FEMPs have been laid out in previous briefs of evidence. Here a clear process has been laid out to illustrate how the auditing of the NDAs would work through the various proposed stages. It is the compliance with farm NDAs as well as with the measures to protect on-farm assets that meet the individual farms' environmental obligations to both the local and the wider receiving environments.

Melissa Robson

Appendix A

Steps from pre-irrigation through staging, full development, in the advent of ratcheting and auditing for farm obligations to the wider receiving environment through NDAs

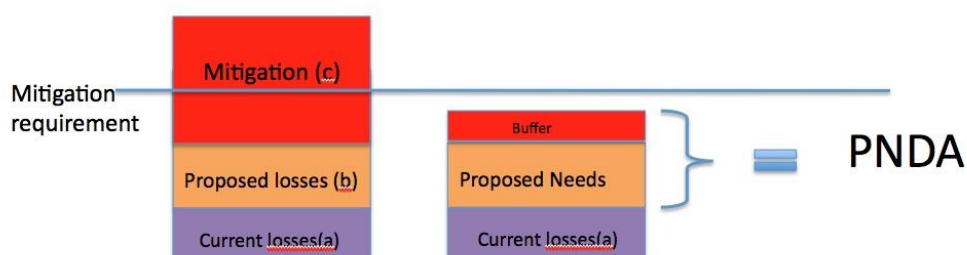
The following section is to illustrate the calculation of the final NDAs and the impact of staging and ratcheting on them as well as how they will be audited. For illustrative purposes, WHL Killermont has been used.

Pre-irrigation

- 1) Establishing the PNDA. The schematic below illustrates how the Proposed NDA is derived from the 'needs plus buffer' figures for a given farm.

Figure 1 Schematic illustrating how the PNDA is derived

Needs plus buffer



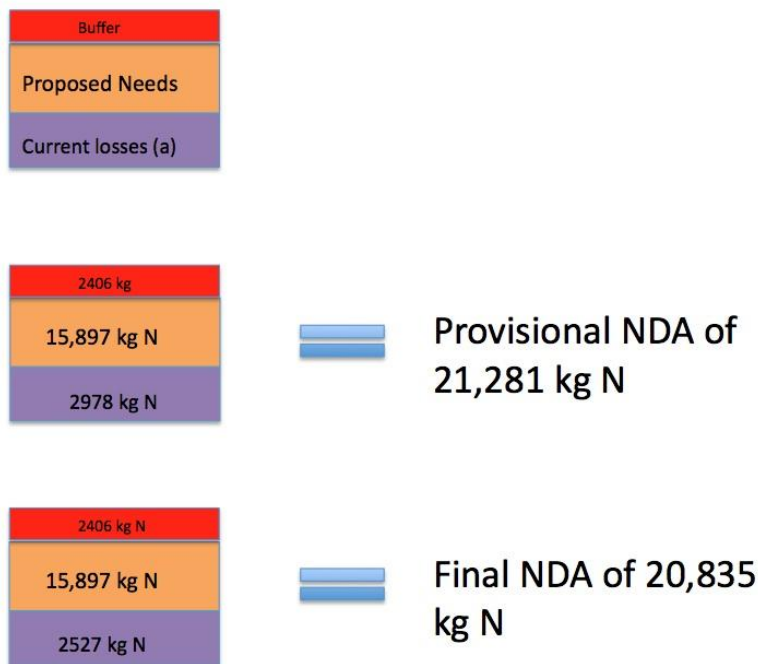
- 2) Establishing the PNDA. The schematic below illustrates how the Proposed NDA is derived from the 'needs plus buffer' figures for a given farm.
 - (a) Establish current losses (a) as modelled by OVERSEER® during pre-irrigation monitoring year
 - (b) Model typical farm practices over past 3 years using mean annual rainfall
 - (c) Include all farm practices typical of farm management regime, such as timing of fertilizer application, stock encroachment in watercourses, grazing of fodder crops etc
- 3) The losses predicted will constitute your benchmarked current losses (a)
- 4) Apply PNDA to benchmarked current losses.

The table and schematic below illustrate how the change in current benchmarked loss may eventually affect the farm NDA. WHL Killermont has been chosen as an example farm.

Table 1 An example to illustrate how a change in benchmarked current losses affect the final NDA

	Current N loss kg	Proposed (mitigated) N loss kg	Buffer N kg	PNDA kg N	NDA kg N
WQS	2,978	15,897	2,406	18,303	21,286 provisional
Benchmarked	2,527	15,897	2,406	18,303	20,835

Figure 2. A schematic to illustrate how a change in benchmarked current losses affect the final NDA

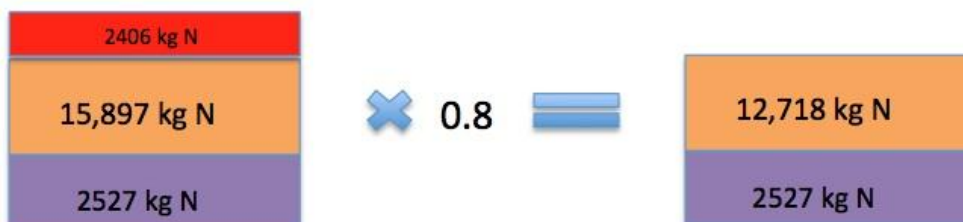


Staged irrigation

An initial stage of 80 % of proposed development is proposed in the 'Lock Step' approach. For the case of WHL KMT, this would be 80% of 15,897 kg N resulting in a permitted increase of 12,717 kg N.

Figure 3. A schematic to illustrate the calculation of the staged NDA

Stage 1 NDA WHL Killermont



In practical terms for WHL KMT this would allow a range of activities, for example, two thirds of the cubicle stables to proceed with the remainder of the area untouched, or 850 ha of sheep and beef with the remainder untouched, or one third of cubicle stables, 550 ha of cut and carry and the remainder untouched.

Auditing

Farms demonstrate their protection of the wider receiving environments through their compliance with their NDAs. This compliance is checked through a comparison with the outputs from the OVERSEER® nutrient budget. The modelling and auditing should be done after the end of the season and must capture all the activities on the farm over the previous 12 months. Annual audit reports are to be sent to ECan before end of July.

Auditing staged NDA

Years 1-5 after irrigation, compliance will be monitored against the staged NDA, which is finalised in the pre-irrigation benchmarking exercise.

For each year, accurate actual farm information inputs should be used with mean annual average rainfall for assessment against staged NDA.

Auditing full NDA

Stage 2 of the 'Lock Step' is full development

Year 6 onwards after irrigation compliance will be monitored against the final NDA, which is finalised in the pre-irrigation benchmarking exercise.

For each year accurate actual farm information inputs should be used with mean annual average rainfall for assessment against full NDA. A mean should be taken after year 1 and up to a 5 year trailing average. This mean figure is the figure assessed against the full NDA for compliance

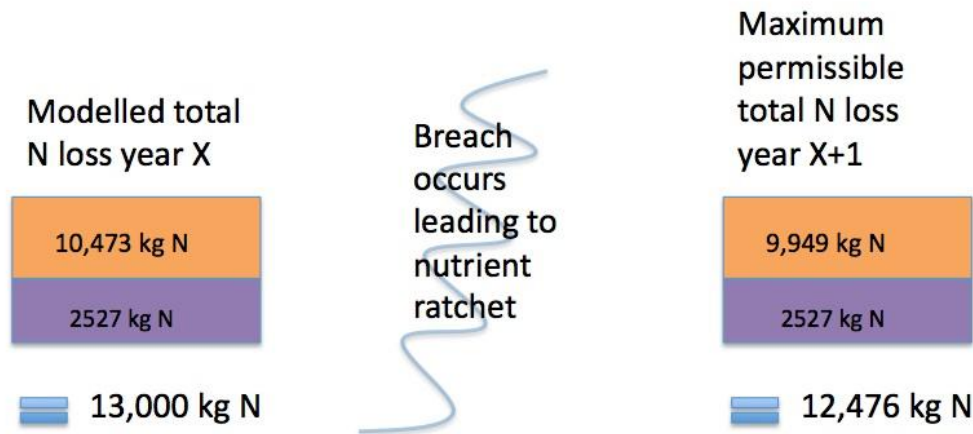
Nutrient Ratchet

Should there be a breach at the threshold and the nutrient ratchet is instigated the following schematic illustrates how this would affect the NDA using WHL Killermont as an example.

The actual losses in the year in which the breach occurs (year x) are taken and 5 % of the losses (excluding current) are subtracted. This gives a ratchet NDA to be assessed for compliance against in year X+1.

Figure 4. A schematic illustrating how a ratcheted NDA is calculated

Example of nutrient ratchet on WHL Killermont



Auditing ratcheted NDA

Year X+1 after breach, compliance will be monitored against the ratcheted NDA.

For year x+1, accurate actual farm information inputs should be used with mean annual average rainfall for assessment against ratcheted NDA.

Auditing on farms for local receiving environments

For local receiving environments, the audit measures are clearly laid out in the FEMPS for each property indicating the what measures are to be audited and how. These have been presented for each property in Tables 4, 7, 10 and 13 of my SHL/FR/KMT evidence in chief and Tables 2, 4 and 6 in Appendix A of my evidence on updated FEMPs. This audit report includes some interpretation of environmental data and also requires external and independent input. The annual audit report is to be submitted to Ecan by the end of July.

Appendix B

Glen Eyrie Downs

High Impact issues

Only Developed setting has been used.

This issue has been addressed in paragraphs 68-75 in my Reply evidence for MWRL. Which briefly outlines the validity of the use of the Developed setting and its use was agreed in expert caucusing

Further to this in paragraph 6(a) of Mr McNae's Addendum report he accepts the use of developed status with accompanying confirmation of that status .

High reliance on herd homes and feed pads to meet targets

I am unsure why the major mitigation measure adopted to meet farm thresholds on Glen Eyrie Downs has been marked up as high risk due to it being relied upon to help meet the thresholds. The reason for the adoption of cubicle stables is that the nutrient losses and other environmental impacts associated with conventional dairy farming were too high.

In paragraph 6(e) of his Addendum evidence Mr McNae accepted that this is not a high impact issue, but a mitigation strategy adopted to reduce nutrient loadings and has no further issue.

Medium Impact issues

No cow weight specified

There is a default in the model that should cow weights not be entered, an average figure will be used. However, as it is a valid recommendation that can be addressed, the OVERSEER® models and FEMPs have been updated to reflect this change. On Glen Eyrie Downs an average weight of 525 kg has been used (B Englebrecht, *Personal Communication*, January 2010), and this caused a small increase in the required supplement to be fed and in the N losses.

On page 10 of his Addendum report Mr McNae accepts that the cow weights used are within normal bounds and has no further issue.

Grass silage imported as opposed to cereal silage

Mr McNae expresses concern that the proposed dairy systems were inefficient, proposing to use of grass based silage supplements as opposed to grain based ones. The use of grass based silage supplements was principally to utilise the excess pasture being grown and conserved on other irrigated stations around the basin, such as the proposed relationship Killermont Station and WHL Killermont. This will prevent hauling supplements over long distances.

In addition, where grass silage is used as a supplement, this will result in a higher N loss than with grain based silage. Given this, the more conservative assumption was chosen to be modelled.

On page 10 of his Addendum evidence Mr McNae accepts the premise for using grass silage and also accepts that while the stations remains within its NDA then it is not relevant where the supplementary feed comes from and has no further issue.

Have used own irrigation concentrations

The default irrigation concentration in OVERSEER® for N is 2.5 mg/l. The source of water for Glen Eyrie Downs is from Lake Ohau. Water quality testing on Lake Ohau was conducted by MWRL (GHD, 2009⁴) and total N concentrations were below detection levels of 0.11 mg/l. The use of 0.5 mg/l is therefore conservative. Default concentrations in OVERSEER® also overestimate the phosphorus 'P' in Glen Eyrie Downs' irrigation water, 0.008⁵ mg/l total phosphorus (TP) in Lake Ohau compared with 0.1 mg/l TP assumed in OVERSEER® (GHD, 2009⁶).

On page 10 of his Addendum evidence Mr McNae accepts the approach and the data used and has no further issue.

Low Impact issues

10 % of nutrient removed in wetlands and filter strips

Wetlands, riparian margins and filter strips have been modelled for GED to reflect the mitigation measures recommended. However the nutrient reductions from these features have not been used to meet the farm Nutrient Discharge Allowance (NDA). The total farm losses for N and P submitted for compliance with the thresholds are excluding the wetland and filter strip effects.

On page 10 of his Addendum evidence Mr McNae accepts the approach and has no further issue.

Other comments

Inefficient nutrient system – nutrient is imported in feed and fertiliser and exported in effluent

The reasons for the use of inorganic N and the export of solid manure have been explained above in paragraphs 10 and 23.

On page 11 of his Addendum report Mr McNae agreed that this issue was beyond the scope of his audit.

WHL Killermont

Many of the same issues have been highlighted for WHL Killermont and Ohau Downs as for Glen Eyrie Downs and responses given from Glen Eyrie Downs apply equally for the other stations. Therefore I shall only make responses here where they differ from those already given.

Have used own irrigation concentrations

The default irrigation concentration for N is 2.5 mg/l . The source of water for WHL Killermont is from the Ahuriri River. Water quality testing at South Diadem on the Ahuriri River (GHD, 2009⁷) found an average total N concentration of 0.14 mg/l⁸

⁴ WQS Summary Report Appendix V

⁵ Samples below detection taken at detection limit of 0.004 mg TP/l

⁶ WQS Summary Report Appendices V and X

⁷ WQS Summary Report Appendix AA

with most samples below detection levels. The use of 0.5 mg/l is therefore conservative. Default concentrations in OVERSEER® also overestimate the P in WHL Killermont's irrigation water, with an average of 0.01⁹ mg/l TP at South Diadem compared with 0.1 mg/l TP assumed in OVERSEER® (GHD, 2009¹⁰).

On page 11 of his Addendum evidence Mr McNae accepts the approach and the data used and has no further issue

Ohau Downs Station

Have used Jersey x Friesian cows – why not Friesian cows that would be more efficient in an intensive system.

The remit of the OVERSEER® audit was to assess the reasonable use of inputs into the models. Ohau Downs have proposed to stock Jersey x Friesian cows, which is a reasonable input and to highlight their choice as a medium risk issue just because they could produce a greater volume of milk using straight Friesians is spurious. In a recent visit to a recently built cubicle stable unit, both Friesians and Jerseys were being housed.

On page 13 of his Addendum report Mr McNae accepted that this was a reasonable input and has no further issue.

High Olsen P on dryland

The Olsen P concentration used in the OVERSEER® modelling on the dryland was an average 39 soil samples taken between 2006 and 2009. The average has been skewed by a few samples with excessive P concentrations. By using this high soil P concentration, P losses will not be underestimated from the dryland areas of the farm.

On page 13 and 14 of his Addendum report Mr McNae accepted that this was a reasonable input and has no further issue.

Killermont Station

Mr McNae reports eleven issues for Killermont Station. Ten of these refer to the modelling of the dairy grazing on Pebbly block. The FEMP to which the OVERSEER files pertain and the evidence presented on Killermont Station clearly state that the Pebbly block is intended for a cut and carry system with no stock and that the stock were required to be modelled to run the OVERSEER nutrient budget. As a result inputs, with the exception of the imported dairy effluent from the neighbouring farm, were kept to a minimum to reflect as closely as possible expected losses from a cut and carry system.

On pages 14 and 15 of his Addendum report Mr McNae accepted this and has no further issue

Unknown drainage status of the land

Where drainage status is unknown, well drained is assumed. This is a correct assumption for Killermont Station. Mackenzie soils are well to excessively well drained soils (Webb, 1992).

⁸ Samples below detection taken at the detection limit

⁹ Samples below detection taken at detection limit of 0.001 mg TP/l

¹⁰ WQS Summary Report Appendix AA

On page 15 of his Addendum report Mr McNae accepted that this was the most appropriate course of action and has no further issue.

References

GHD (2009). Cumulative Water Quality Effects of Nutrients from Agricultural Intensification in the Upper Waitaki Catchment – Summary Report.

Greenwood, P,B. (1982). Irrigation research at Tara Hills High Country Research Station 1948-1982. Ministry of Agriculture and Fisheries. Mosgeil.

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