

# Report to the Collaborative Stakeholder Group – for Agreement and Approval

**File No:** 23 10 02  
**Date:** 17 September 2015  
**To:** Collaborative Stakeholder Group  
**From:** Chairperson – Bill Wasley  
**Subject:** Options for using Overseer model to manage nitrogen and phosphorus at a property-level  
**Section:** **Agreement and Approval**

## Disclaimer

This report has been prepared by Waikato Regional Council policy advisors for the use of Collaborative Stakeholder Group Healthy Rivers: Wai Ora Project as a reference document and as such does not constitute Council's policy.

## 1 Purpose

The purpose of this report is for Collaborative Stakeholder Group (CSG) to understand the sub group's findings on benefits and constraints of using the OVERSEER® (Overseer) nutrient model in policy options to manage nitrogen and phosphorus at a property level.

## Recommendations:

1. That the report [Options for using Overseer model to manage nitrogen and phosphorus at a property-level] (Doc #3507568 dated 17 September 2015) be received, and
2. That the CSG confirm that the benefits and constraints of using the OVERSEER® (Overseer) nutrient model for managing nitrogen and phosphorus at a property-level have been satisfactorily identified by the CSG subgroup that met on 9 September 2015 (representatives for dairy, drystock, rural professionals, rural advocacy, with WRC staff, Helen Ritchie and Technical Leaders Group).
3. That the CSG nutrient limit and Overseer sub-group meets again (open to other interested CSG members, with a pencilled in date of 6 October) after 1-2 October when the Round 2 scenario modelling results are known, to:
  - a. further consider viable options for managing nitrogen and phosphorus at a property level, and
  - b. report back to the CSG at their 13-14 October meeting.

## 2 Overseer CSG sub group process

A CSG sub group met on 9 September 2015. Members volunteered at CSG 15 in August, during discussion of a recommendation to do further work on the use of the Overseer model (CSG report “Policy option of a property-level limit for nitrogen and phosphorus”). The subgroup included representatives for dairy, drystock, rural professionals and rural advocacy.

Everyone at the meeting had considerable experience with the Overseer model and contributed this to the discussion. CSG were assisted by Helen Ritchie, Mike Scarsbrook from the Technical Leaders Group and WRC policy, consents and extension staff with expertise on Lake Taupo catchment nitrogen rules.

Other information included:

1. Biophysical and economic modelling work by the Technical Leaders Group and brief emailed comments about the Overseer model from Bryce Cooper.
2. Report to CSG 16a September 8th 2015. “Policy option of a property-level limit for nitrogen and phosphorus”. Document #3476854 dated 24 August 2015. Two options were put forward. These were the basis for the sub group discussion.
3. There is national work on Overseer model, due to be finished in December 2015. Some of the sub group are involved in a Ministry for Primary Industry-led national project to assist councils who are using or considering use of Overseer to manage the adverse effects of nitrogen and phosphorus on water quality. As the first part of this project, a stocktake of how Councils currently use it is available soon – the draft of this stocktake report was used in the policy report above.

## 3 Achieving property-level limits - defining and labelling the approaches

The subgroup discussed property-level limits that are either achieved by:

1. Each landowner having a numerical limit they must meet, or;
2. Each landowner having actions in a property plan they must meet.

They agreed that Overseer was integral to the two approaches discussed. Concern about fairness in the effort made by individuals and sectors, arises in both approaches. We are familiar with the debate about equity and fairness when councils decide initial allocation of a numerical property-level limit for nitrogen (Taupo, Horizons, Bay of Plenty). If CSG chooses to require tailored property plans as a policy option, equity between sectors and individuals will need to be resolved.

The language we use to label each approach makes a difference.

At the meeting the emotive words used were “hard” limit versus a “soft” limit for 1) and 2) above. If we replace these terms with ‘numerical limit’ and ‘property plan’, it helps us avoid taking positions for no good reason.

Therefore the working definitions and labels for the two approaches are:

### **Numerical limit**

A numerical limit is one where a specific amount of nitrogen or phosphorus (most likely specified as a maximum of kilograms of nutrient per hectare which can be lost per annum) is formally allocated to a property by the Council, and cannot be exceeded other than via a consent. Compliance action is likely if the specified amount is exceeded.

### **Property plan limit**

A property plan limit approach is where the landowner would be benchmarked against current practice (again in terms of kilograms of nutrient per hectare which can be lost per annum), and then uses a Council OR Industry agreed environmental tailored property plan to:

- (a) ensure that the benchmark<sup>1</sup> is not exceeded, and if needed to meet water quality outcomes,
- (b) look to achieve an agreed reduction (set by the Council) over an agreed time frame.

Both approaches use Overseer and once the limit is established, the property owner does the same thing to achieve outcome. A regulatory body can monitor and enforce either the numerical limit or the property plan limit.

## **4 Benefits and constraints of using Overseer nutrient model at a property level**

For a simple description of the Overseer model, see Attachment 1.

For facilitator Helen Ritchie's notes of the CSG subgroup meeting on 9 September, see Attachment 2.

The benefits and constraints of using Overseer nutrient model at a property level are outlined below.

### **Overall Benefits**

Overseer is the only available tool that gives us an output-based nutrient balance for a property. This makes it a powerful 'learning model' about the management of nutrients, giving a user the ability to test different 'what if' scenarios. This in turn allows flexibility to decide what the best mix of practices is for a property that has particular goals (whether that is efficient use of nutrients or reducing environmental footprint).

If we assume the CSG's job is to get landholders to change their behaviour and make sure their properties are 'less nutrient leaky', then Overseer is an integral part of any policy option chosen.

### **Overall Constraints**

Overseer model is always in catch-up with mitigations that landholders might want to use. There is highest confidence for the most 'typical' farming systems with least variability, particularly dairy systems. There is less confidence for arable and horticulture systems and farms with a lot of bought in feed or that trade stock and make changes throughout a

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<sup>1</sup> Although the benchmark figure is written as a number of kilograms of nutrient per hectare which can be lost per annum, it would not be a formal allocation. This is in contrast to the numerical limit approach, where the decision on initial allocation results in each property or sector given the upper limit of kilograms of nutrient per hectare which can be lost per annum. For instance, with grandparenting you get the number you have been leaching historically (Taupo), with sector averaging you get the average loss number for your sector (draft Rotorua lakes plan) and with Land Use Capability, you get the loss number that relates to the soil or land you are on (Horizons).

season. Mitigations are being added to the model all the time, but there is a tension between getting them in the model and being confident that complex biological systems are properly represented. It is a disincentive to landholders innovating if they can't get the benefit from the regional council (whether it be regulation or financial incentives) from mitigations that are not used in the model.

## What if Overseer model is used in a numerical limit?

In addition to the general points above, there are aspects that are specific to numerical limits.

### Benefits

Setting a number that has to be achieved at a property level gives the public a sense of certainty that water quality limits will be achieved.

There is incentive to innovate when an outcome is set and people get the choice of how they can most easily achieve it.

### Constraints

Overseer is constantly being upgraded. It could be seen as a measuring tool that has component parts adjusted up and down every couple of years. That means that the same property-level inputs to each new version could give a higher or lower nitrogen or phosphorus output. We can't predict how each landowner will be impacted because each property has a different mix of inputs, and the changes are not constant for each version change. This is what people refer to as 'problems with version control'. There are ways to work around this, but they take extra resources to run original input data through each changed version and the council has to be careful about perceptions that landowners are not complying with property limits.

Experience in Horizons has been that the policy and rules are written as numerical limits but are not being implemented that way. Instead, dairy farmers who are subject to the rules are granted consents where they have to demonstrate nitrogen reductions by achieving actions set out after negotiation between consent officers, farmers and expert farm system advisors. What started out as a numerical limit in the plan, using Overseer version 6, is being implemented as actions specified in a property plan where the latest version is used.

While there are issues around Overseer version changes, the reverse also poses issues. If a Council sticks with a particular version, then landowners miss out on the new mitigation practices and new science built into the later versions.

## Phosphorus

In addition to the points above, the sub group considered the use of Overseer for phosphorus. They agreed that 'phosphorus loss on a farm is more like a collection of hotspots, whereas nitrogen leaching is truly diffuse'.

### Benefits

As for nitrogen, there are benefits about flexibility and assisting learning and behaviour change.

Recently there has been greater confidence by scientists at AgResearch<sup>2</sup> that Overseer can accurately model phosphorus losses. For instance, it is possible to account for peat soils that are known to leach phosphorus (instead of the more familiar idea of phosphorus being attached to soil particles that are washed into water across land). Mitgator is a model that

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<sup>2</sup>CSG subgroup members were referring to Richard McDowell's work (AgResearch).

'bolts on' to Overseer to give a spatial GIS capability, but this is not likely to be freely available for several years.

### **Constraints**

Because Overseer is not a spatial model, users would have to make sure that different contour (and therefore erosion risk) on a property was reflected in the way data was put in. For extensive drystock farms this might be more much onerous than looking at mitigations for phosphorus loss based on expert knowledge. It was pointed out by the subgroup that it might be just as effective for the farmer to know they must keep heavy stock off steep slopes in the wet, as it is to model current practice on all the different farm blocks.

Developing sufficient capability and capacity to use the model in a consistent and cost effective way at a large scale (thousands of landholders) is a constraint that applies to both numerical limits and farm plans.

## **5 Discussion**

While there was lively debate on how Overseer can and should be used, the sub group felt it was too soon choose a viable way forward because the size of the problem isn't yet known. For instance, the scale of nitrogen or phosphorus reductions at a property level will be easier to judge once the results of the modelling re-runs are discussed at the 1<sup>st</sup> and 2<sup>nd</sup> October CSG meeting.

At the meeting the policy team shared the following questions in a decision tree:

### **Technical questions**

- How much nitrogen reduction is needed to 'maintain water quality'?
- Do we know enough about chlorophyll and nitrogen and phosphorus<sup>3</sup>? Do we know enough to try to make reductions needed on properties less onerous than the first round of modelling is showing?

Initial responses from Technical Leaders Group is that reports about to go the CSG say that we do know the quantum of nitrogen reduction for the Upper Waikato to maintain water quality. And as directed by the CSG, the second modelling runs are looking at a 'Phosphorus targeting- and nitrogen holding' set of scenarios.

### **Policy and project questions**

- If we decide on a hard limit, do we have time to decide initial allocation that takes into account aspirations of different people, in time to consult with people at the end of October?
- If we decide on using Overseer in a farm plan, do we have time to decide how actions to create reductions are spread?

Policy staff noted that the answers to these questions will help the CSG decide their strategy for the plan change in 2016, including how much it will require of affected people as a first stage toward full achievement of the Vision and Strategy.

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<sup>3</sup> Clarity is influenced by sediment and chlorophyll, and chlorophyll is influenced by N and P. Chlorophyll (median and max) is an attribute.

## 6 Summary

Overall, the group concluded the Overseer model was a valuable tool to understand how actions on a property influence nutrient outputs. Output models promote flexibility and innovation. Constraints centred around the fact that Overseer is being updated all the time. Because regional councils are using the model in such varied ways, including in processes where farmers were seen as not complying with limits even though they had not intensified the amount of nutrient coming into the farm system, there was reservation amongst the sub-group for using Overseer in a numerical limit.

Regardless of how Overseer model is used in the plan change, there needs to be sufficient capability and capacity to use it in a consistent way for thousands of landowners. Some form of tailored property plan that sets out what actions landowners take to manage nutrient, is a basic requirement of both approaches<sup>4</sup>. The practicality and resources and skills needed to develop these plans, is being investigated by the policy team, WRC implementation and industry staff and CSG sector representatives, and will be reported back on 13-14<sup>th</sup> October CSG meeting.

As well as discussing detail about the Overseer model, the sub-group identified some big questions related to nutrient limits that the CSG will need to resolve. These included questions around:

1. Amount of nutrient reduction needed on the land to achieve water outcomes, what the timing should be, and how this is staged over more than one regional plan.
2. Fairness in the effort made by individuals and sectors to achieve outcomes. These aspects need to be resolved regardless of whether the CSG:
  - chooses to use Overseer as part of a property plan approach, or
  - Uses Overseer to set and implement a numerical limit.

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**Bill Wasley**  
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**Attachment 1** – Refresher on Overseer model and national project on using it in water quality limit-setting processes

**Attachment 2** - Facilitator Helen Ritchie's notes of the CSG subgroup meeting on 9 September

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<sup>4</sup> For instance, the Lake Taupo Catchment rules set a numerical N limit, and this is achieved by the farmer having an up to date nutrient management plan that lists all the nitrogen related inputs and actions (how many stock are carried over winter and how much fertiliser put on and when).

## 7 References

Arbuckle, Chris. August 2015. Stocktake of Regional Council Uses of OVERSEER® Prepared for Ministry for Primary Industries; Regional Council Resource Managers Group and Regional Government.

Collaborative Stakeholder Group Workshop 14 Notes. 10<sup>th</sup> and 11<sup>th</sup> August 2015, DM #3471459.

Facilitation session notes from CSG Workshop 13, 2 and 3<sup>rd</sup> July 2015 DM #3445619.

Waikato Regional Council 2014. Report to CSG workshop 2 Case Study I: Lake Taupo catchment property-level nitrogen discharge limits document number 3034258.

Waikato Regional Council 2014 Regional Council approaches to diffuse discharges and water quality– Report prepared for the Collaborative Stakeholder Groups workshop 5, dated 20<sup>th</sup> March 2014 DM #2325986.

Waikato Regional Council 2015b. Exploring industry farm plans as a policy option; including industry-supported farm plan with regulatory backstop” DM# 3454905.

Waikato Regional Council 2015c. Policy options for sediment, microbes, nitrogen and phosphorus. Agreement and Approval report dated 22 June 2015. DM #3425911.

Waikato Regional Council 2105. Policy option of a property-level limit for nitrogen and phosphorus. Agreement and Approval report to CSG Document #3476854 dated 24 August 2015.

Waikato Regional Council (Online Version). Waikato Regional Plan. <http://www.waikatoregion.govt.nz/Council/Policy-and-plans/Rules-and-regulation/Regional-Plan/Waikato-Regional-Plan/>

# Attachment 1 Refresher on Overseer model

OVERSEER® (Overseer) is a freely available online application, developed by AgResearch Limited, with support from the Ministry for Primary Industries and the Fertiliser Association of New Zealand.

Overseer enables farmers and growers to examine nutrient losses, including nitrogen, phosphorus and greenhouse gases, which are directly attributable to their operation. They can calculate the impacts of management changes on discharges, including by testing “what if” scenarios, providing information to land managers to assist decisions on farm. By combining this environmental information with knowledge of their operation, and financial advice, managers are able to adopt practical solutions that benefit the environment and may also have associated financial gain (Arbuckle 2015, in prep, p3)

As the model is updated by the owners, new versions are released, and existing versions are no longer publically available. This is an important factor to consider in policy development. Problems can arise when the ‘measuring stick’ changes but nothing else has changed on farm.

The Technical Leaders Group has been using Overseer to support catchment modelling and establish water quality contaminant loading under different future scenarios.

## **National work on the use of Overseer in water quality limit-setting processes**

In early 2015, work began on a national project to assist councils who are using or considering use of Overseer to manage the adverse effects of nitrogen and phosphorus on water quality. The first stage is due to be completed at the end of August 2015, and summarises how regional councils currently use Overseer in policy, regulation, compliance and advice, and identifies regional council priorities for guidance material on using the model.

The project came about because regional councils are currently using Overseer in a variety of ways across policy development, regulation, compliance and advice, and use is expected to increase substantially as councils begin to implement the National Policy Statement for Freshwater Management 2014 (NPS-FM).

The project brief notes that:

Implementation of the NPS-FM involves setting limits for water quality. The use of Overseer to inform limit setting and managing within limits enables “effects-based” controls on outputs, especially nitrogen. Such output controls are seen as preferable to input controls as they are regarded as more flexible, efficient and effective.

Many councils are using Overseer to inform catchment land use scenario analyses which often underpin the limit setting process. However, it is the application of limits at the farm scale that is most contentious. Although the use of Overseer to set limits has withstood some legal challenges, there is much less clarity on its use for compliance. There are challenges in incorporating Overseer numbers into regional plans due to version changes (Stocktake of Overseer Model Project brief MPI 2015, page 1).



# Attachment 2 Meeting notes of a sub-group of the Collaborative Stakeholder Group

## Nitrogen and phosphorus limits and Overseer nutrient model

**Date:** 9 September 2015, 12:00pm – 3:00pm

**Location:** Waikato Room, Kakariki House, 293 Grey Street, Hamilton East

**Attendees:** CSG members/delegates – James Bailey, Charlotte Rutherford, Phil Journeax, James Houghton, Rick Pridmore

TLG members – Mike Scarsbrooke

WRC staff – Justine Young, Emma Reed, Mark Brockelsby, Jon Palmer (on phone)

Facilitator: Helen Ritchie

Apologies: Bryce Cooper (TLG)

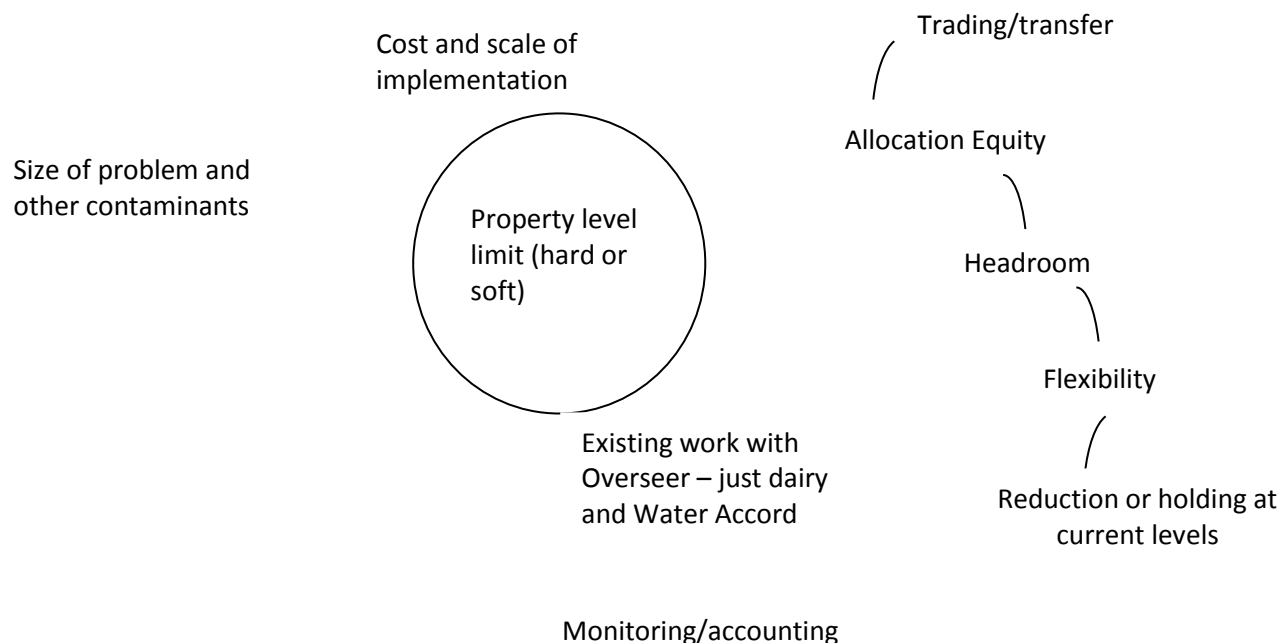
**Purpose:** To explore constraints and benefits of using the Overseer model for a hard (a number) or soft(input to a list of actions/plan) N (or P) limit at property level.

**Output:** A clear summary of constraints and benefits of using the Overseer model for the CSG and a recommended way forward.

**Pre-reading:** CSG report in agenda pack for 8 September meeting, called 'Policy option of a property-level limit for nitrogen and phosphorus'. Document #3476854 dated 24 August 2015.

*The notes below are from the whiteboard and butcher paper, and record participants points as written by facilitator Helen Ritchie.*

### Other topics which surround property level limits not discussed at this meeting:



### Benefits of using Overseer:

- Measures outputs, not input control
- Flexibility

- Only readily available tool for a nutrient balance on a farm – to quantify leakage, measure and monitor
- Identify high 'leakage' farms to bring them down fast
- Some in the community like this way to assess/show reduction
- 'Certainty' for public and regulator
  - Easy to write into rule/policy
  - Can see how burden is spread
  - Easy to monitor/possible to enforce
- More important if big reduction needed (land use change)

Note: there is an Overseer model national project led by MPI, on use of Overseer in regional council water quality limit-setting processes, due by Christmas. As the first part of this project, a stock take of how Councils currently use it is available soon – the draft of this stock take report was referenced in a recent CSG report Policy option of a property-level limit for nitrogen and phosphorus. Document #3476854 dated 24 August 2015.

### Constraints of using Overseer:

- Changing versions – hard if you have traded your surplus based on old version and it changes
- Complex model
- All models can be challenged
- Each property unique
- Predicted N loss in root zone - unknowns in attenuation (to meet a river limit)
- Like any model it requires consistency of how data is put into it. Because the model is freely available to anyone, it could be 'fiddled' – deliberately or not.
- Competency of input person, resourcing of doing it for every farm
- Hard to audit some components e.g. timing of inputs (but most can be audited)
- Hard to maintain flexibility especially through winter – actual differs to budget e.g. extra lambs born. The work around for this is to do ex-poste analysis.
- Doesn't deal well with alternative products (but the model allows users to enter put your own in). There were questions around how this work in regulatory sense.
- Doesn't deal well with some parts of dairy systems (e.g. feed barns and applying effluent as fertiliser vs. Effluent as well as fertiliser. Works best on 'standard' systems)
- Model is always in catch-up mode
- Mitigations have to go through rigorous testing – systems are dynamic
- Lots of mitigations aren't in Overseer so if farmers do them, they get no credit/benefit
- Creates incentive to do that science BUT disincentivises actions outside the model on farm
- Often quoted is an error rate of +/- 20% observed vs. predicted
- Unclear causal relationships – can be contrary to expert judgement
- Unclear signals for behaviour change
- As long as it continues to evolve (learning tool) it is 'unstable' as a regulation tool
- Versions
  - If you don't update versions, you don't access latest mitigations
  - Reassess under new version or
  - Benchmark baseline inputs and transfer to new version (on comparative basis). This is Horizons' One Plan way to deal with issue.
- Hard limit → softer one
- Doesn't deal well with horticulture  
Works best

Dairy

↓  
 Drystock  
 ↓  
 Horticulture  
 ↓  
 Other land uses  
 Works least well

- More variable systems

**Phosphorus:**

- P-better to manage through farm plans/best practices e.g. managing stock in wet places/seasons – behaviour less likely to impact on whole farm system (for dairy) c.f. N
  - An easier way to manage it
- Critical Source Area issues – unique flow paths on your property – hotspots ID
- Not a spatial model
- Concern that can't model a system that matches stock class to LUC. It is possible to do this, because Overseer inputs are put in block by block (user identifies which blocks they are splitting their property into to – ones that have different management and therefore different inputs)
- Does model protection of soils
- P is like a collection of point sources vs. N is truly diffuse
- Less than 1kg/ha P loss
- Actions similar to those for sediment and microbes

**Other ways:**

- Pick high risk proxy factors to identify high leaching risk and use input control e.g. limits N/ha relating to that risk = Permitted Activity
- Texas 2-step
- (simplified monitoring system)
- Staged effect
  - 1st stage – get everyone doing GMP so it's more equitable and stop land conversion and edge of field ~ 7% N reduction
  - 2nd stage – how much further reduction?
- How do you allocate responsibility for making change? To discuss next time

**Ways to use Overseer:**

Allocation ↑ ↓ Target poor practice/bell curve not a quantum	<ul style="list-style-type: none"> <li>• Overseer <u>will</u> be used at property level</li> <li>• Alternative ways to use it</li> <li>• Benchmark (e.g. dairy industry 100%) look at N conversion efficiency</li> <li>• Set a hard number (discharge allowed)</li> </ul> <ul style="list-style-type: none"> <li>• Set a percentage reduction</li> </ul> <ul style="list-style-type: none"> <li>• Use as an input to a farm plan to help determine actions to take with Expert advice/other sources of information</li> <li>• Still will be used to monitor and do catchment accounting</li> </ul>	All arrived using Overseer ↑ Audit against No ↓ Audit against action list
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- If using as a 'soft' tool in a farm plan
  - Use accredited people
  - Follow up
  - A way to impute how much reduction might result – Overseer + 'other' to account for mitigations – quantify
    - Add these reductions to assess if there's sufficient reduction at catchment level
  
- If using as a 'hard' limit piggyback on industry SMPs etc and random audit (can't roll out Taupo-WRC led)

**Next steps:**

- Report this back to CSG workshop 16b on 21<sup>st</sup> September 2015
- At this session, ask CSG for mandate for subgroup to discuss wider topics related to N limits. Pencilled in another session on afternoon of 6<sup>th</sup> October 2015, invite any other CSG members to join