

Combined Kaituna/ Maketū and Pongakawa/ Waitahanui Freshwater Futures Community Group Workshop 7 Notes: Mitigation Bundles, baseline profit, intro to environmental flow setting

Pongakawa Hall, 925 Old Coach Rd, Pongakawa

Friday 6 April 2018 commencing at 9.00am

Members present: *Kaituna/Maketū CG* - Barry Roderick (Chair), Claudia Hellberg, Cor Verwey, Hendrik Metz, Hohepa Maxwell, Ian Schultz, Julian Fitter (in both CG's), Mary Dillon, Matthew Leighton, Murray Linton, Nick Webb, Peter Ellery, Richard Fowler, Warren Webber and Councillor Norm Brunning (attending on behalf of Councillor Paula Thompson)

Pongakawa/Waitahanui CG - Wilma Foster (Chair), Councillor Jane Nees, Andre Hickson, Bev Nairn, Darryl Jensen, Dennis Walker, Geoff Rice, Grant Rowe, John Garwood, John Meikle, Julian Fitter (in both CG's), Melv Anderson, Mike Maassen, Paul van den Berg,

Apologies: *Kaituna/Maketū CG* - Councillor Paula Thompson (Councillor Norm Brunning attended on behalf), Brian Thomas, Doug Hallberg, Jeff Fletcher, Jessica Dean, John Fenwick, Jon Fields, Manu Wihapi, Maria By de ley, Maria Horne, Morgyn Bramley, Vivienne Robinson

Pongakawa/Waitahanui CG - Bernie Hermann, Colin McCarthy, John Cameron, Kevin Marsh, Roku Mihinui, Te Awhi Anderson Manahi (called in to pass on apology)

BOPRC Staff present: Kerry Gosling (Facilitator), Stephanie MacDonald (Facilitator), Pim de Monchy (Relationship Manager), Nicki Green (Water Policy), Santiago Bermeo (Water Policy), Jo Watts (Water Policy and Administrator), James Dare (Environmental Scientist – Water Quality)

Guest: Lee Matheson from PerrinAg Consultants

Observer: Rani Dhaliwal (University of Waikato PhD student)

Related documents previously circulated:

- Workshop briefing paper – Mitigation bundles and baseline profit estimations.
- Introductory information: Setting environmental flows in Water Management Areas.

1 Welcome /Updates/Focus of the day

Geoff opened the workshop with a karakia.

Barry welcomed everyone and introduced new member Matthew Leighton (WBOPDC) replacing Marc Fauvel.

Stephanie acknowledged this is the first combined meeting of the two groups and the long time between workshops. She thanked members of the Pongakawa Community Group for the field trip showing places of cultural importance. She introduced guest Cr Norm Brunning in place of Cr Thompson and new/replacement Kaituna Community Group member Claudia Hellberg (Tauranga City Council). Steph introduced staff, visitors and invited community group members to get to know each other at their tables for 5 mins.

1.1 Agenda, purpose and updates

Presentation slides are available online.

Nicki explained the work programme and current progress. Kerry introduced the purpose of the workshop, and the agenda for today:

- National, regional and Plan Change 12 updates
- Mitigation bundles and costings
- Introduction to surface water quantity
- Next steps.

Confirmed the purpose of the group (as outlined in slides). The Council is also engaging with iwi and hapū on this work in parallel. Staff are responsible for presenting the agreed and different views gathered to Councillors who are the decision makers.

Question / comments:

How are the mitigation bundles going to be used? A: The purpose is to define management practice bundles to model so we can explore how well they would address water quality issues. We are not selecting solutions yet. Santi will explain further.

How will good management practices fit in the regulatory framework? Will we need rules if good management won't fix issues? A: We have not reached the point of defining what we would or would not regulate. We are only in the exploratory stage. Council has heard clearly from all community groups that we should first explore whether good practice / non regulatory measures would get us where we need to be.

Will it get us where we need to be? A: Possibly not for some contaminants and in some locations. It is fair to say councillors are aware of this as well.

1.2 National and regional update

Nicki noted that the Minister for the Environment has indicated there will be further changes to the NPSFM, including to add sediment as an attribute. In addition, he has asked the Land and Water Forum to advise on what central government could do to halt declining water quality now. One of the options being considered is land use intensification regulation but we won't know the outcomes until about June 2018.

Regional update

Te Maru o Kaituna is meeting on 27 April to finalise decisions and, if all goes to plan, is likely to release the final Kaituna River Document in June /July. This includes a vision, objectives and desired outcomes that will need to be recognised and provided for in PC 12

Regional Policy Statement Change 3: Rangitāiki is subject to two Environment Court appeals

Plan Change 9 (Region-wide water quantity) hearings have finished and the hearings panel is deliberating. Decisions will be released in June 2018.

Central government has set national targets for swimming/primary contact in specified rivers (4th order and above, i.e. large rivers) and lakes and has estimated how regions are performing using regional monitoring information and a model. Regional Councils are to set regional targets for improving water quality for swimming over time. Based on Ministry for the Environment modelling of Council's planned catchment management activities, Council has set a draft target of 95.7% of specified rivers and 85% of lakes swimmable by 2030. These regional targets do not replace or override the work we are doing in this WMA to set objectives and limits for swimmability/primary contact recreation.

Pim noted that there is a performance indicator in Council's Long Term Plan to increase swimmable rivers by 4% every two years – includes the smaller streams but only those monitored (about 20).

Action:

Link to the list of 'specified' rivers in this WMA. Visit the map at <http://www.mfe.govt.nz/fresh-water/about-freshwater/bay-of-plenty> Hover over rivers to view their names.

Questions / comments:

Group member asked whether anybody in the room would disagree that waterways are declining? Some debate between members. Pim noted that it is different for every waterway and depends which contaminants we are looking at. By way of example, in Kaituna, *E. coli* counts are generally decreasing while nitrates are increasing. At the top of the catchment we have some examples of improving quality due to good work of land owners. Nicki noted that it has been a long time since the group focussed on current state (workshop 2) and we will revisit this so that we can make sure we focus on real issues in the WMA.

What does 4th order mean? A: 1st order is where the river starts up in the head waters, when two first order streams join / confluence it becomes second order, next confluence is 3rd order, then 4th. So 4th order streams are generally pretty big.

2 **Project update** (slide 15)

Nicki noted that Council staff intended to bring surface water catchment modelling information to the group by now, but this is taking longer than expected. The modelled inputs need to marry up with measured water quality. Scientists now have modelling results and they are ironing out final issues with the modellers before preparing the information in a form that is understandable to all of us. This will be ready for the next workshops and tied to draft objectives.

Nicki summarised progress made at previous workshops and explained the focus of the day is to work on good management practice bundles so that they can be modelled.

Questions/comments:

Do the levers on the modelling diagram represent where we currently are? A: No. The lever indicates we can shift it up or down and explore the results for water quality.

Good management may fall short of change required - why settle for good management if it is not good enough? A: The purpose of exploring good management practice options through the model is to determine whether it will be enough to achieve the outcomes you seek in your preferred in-river state statements. If it is not enough, further steps will be explored.

Will further steps include regulating land use? Will good management practices be permitted activities? A: There are a range of options including nutrient budgets/allocation, land use regulation, etc. These have not been explored yet.

What nutrients / contaminants is the model focussing on? A: Nitrogen, Phosphorous, *E. coli* & Sediment. We will estimate what sort of reduction is needed and what good management practice might achieve.

3 **Mitigation bundles and costings** (Slide 19 Santi & Lee – Perrin Ag)

Santi introduced the modelling and mitigation bundles work. He used an analogy in which a river is like a "cup of tea" - we set a water quality objective that is about "how strong the final sugar concentration should be in the tea", then limits on how much sugar "load" we can put in the tea to achieve that objective.

Santi reminded the group of previous discussions at workshops 5 and 6 about the wide range of potential management practices. He also noted that Council sent out a survey

because community group members wanted more time to respond to the workshop questions. Unfortunately response rate wasn't great. It was acknowledge that the survey was hard to answer if you aren't a farmer or grower in the catchment.

The focus today is on agricultural practices. Santi will also talk to industry groups and will explore good management of point source discharges. Council engaged Perrin Ag Consultants and Landcare Research to give advice about grouping mitigation bundles and on estimating costs of these. The workshop pack contained PerrinAg & Landcare Research's report.

Santi introduced Lee from PerrinAg (starting with slide 25).

Lee explained the basis for mitigation bundles, noting it is important to understand modelling reveals relative differences and this is important. We don't have time or money to model each individual farm but need to do enough to understand relativity.

PerrinAg reviewed all relevant studies and literature – some actual data and others modelled. The report is in the notes for background and context. PerrinAg has a team of 14 operating in BOP, based in Rotorua, and manages 28 farms so do understand impact of mitigation practises.

Good management practice M0-M1 vs best management practise M2-M3. The groupings are a bit subjective but correlated with actual measured / monitored data from waterways. Lee explained diagram (slide 25) – the work is not trying to achieve any particular water quality targets. The biophysical model will do this.

The mitigation bundles are focussed on contaminant loss (N, P, Sediment, *E. coli*) from rural land uses – farming, hort, forestry etc. Mitigation bundles are larger for pastoral farming which reflects research and literature extent.

Initial assessment (slide 26) – Cost is estimated based on how much of your pre-tax profit (EBIT – Earning Before Interest and Tax) – i.e., not thinking about tax, interest or principal repayments. Just how much falls out of profit because of the mitigation.

Questions/comments

Don't we know how much sugar we have in the tea? We monitor and measure the concentration in the river (i.e., in the cup of tea), but we don't know how much each source is loading in to the river. That's what we use modelling to help us with.

Does it matter how much sugar is in the tea if ecology is healthy? A: The concentration of sugar in the tea is set to support a value, e.g., healthy ecology, swimming etc.

MCI can be used in an objective. How does that relate to the tea? A: Yes, MCI will be used. The analogy has its limitations 😊.

We don't know what current practise is so how can we estimate better practice? A: For modelling purposes, we have estimated general "on average current practice" assumptions based on previous community group feedback, previous engagement with industry. The consultant has a good general knowledge about farming in the catchment, although we have limited understanding of the uptake of certain practices. Upcoming engagement with industry is aimed at better defining current practice.

What is the uncertainty? A: We will need to explore/express uncertainty/confidence when we present numbers.

Will we cover M4 (more than agricultural practice changes within the same land use) at the next workshop? A: At a future workshop, if needed.

In these costings, we don't appear to be estimating the economic / detrimental cost poor water quality is having on me/my values in the river? i.e., the cost of not doing it will continue to be transferred to the community and environment. A: The work we are discussing today is about the cost of mitigation practice actions. Council will express the in-river values and their importance, but probably not by putting a \$ value on them. The

community groups have expressed their in-river values and have drafted “preferred state for in-river values”. Staffs are tying numerical water quality and ecological measures to these (including MCI for invertebrates). The technical challenge ahead is then figuring out what, N, P, *E. coli* and sediment reduction is needed to support the values. Once we understand the implications of meeting the “preferred state for in-river values”, each community group wanted a chance to revisit those statements if they think we need to.

One member noted preference for this format rather than the Crown telling us what we are to do.

How do we know what effect current practise is having on the catchment? A: That’s what the modelling will help us to estimate.

Are you able to give us an approximation of % of people within the catchment sitting at M1, M2 etc? A: No. People put in mitigations and make decisions for very different reasons. As a group we aim to get it “about right”, and to represent average farms/orchards within each system.

Some good practise would improve profit and reduce contaminants. A: Yes

MORNING TEA

3.1 **Activity – Mitigation bundles and costings (Facilitators/ Santi/Lee)**

1. Steph asked members **to sit in sector groups** they are most knowledgeable about/ interested in

2. Pages 18 - 20 of the PerrinAg report are the key ones we are going to work on

3. Overview of activity (slide 28) Activity discussion questions

- Are the mitigations in the right bundles? Why/ Why not?
- Are there any sector appropriate mitigations missing that should be added?
- Are any of the listed mitigations out of the question?

4. Discuss the Mitigation bundles M1, M2 and M3 for dairy pastoral sector groups.

Staff will sit in on the groups to listen, clarify technical language and ask questions to encourage deeper discussion or to draw out quieter participants. Staff should not write on charts for group members. (10 mins)

5. Feedback (15 mins)

- Each sector group is to feed back their top three changes and why. Facilitator/s notes changes on sticky wall. Other sector groups can ask questions.
- At end of feedback, check in they are comfortable with location of management options- or note exceptions.

Groups were to work through all five sectors in turn starting with dairy pastoral because it has the longest list. The feedback from this exercise will be used to put forward mitigation practices for modelling that can reasonably be applied. Distributed A3 charts for “Dairy Pastoral”. Every table looked at the dairy. Dairy farmers were asked for their top three mitigations in each bundle.

Suggested amendments to the mitigation bundles are attached in Appendix 1. Some additional feedback is included below.

Questions/comments

Urban land use? A: Not included at this stage but will be.

Is reference to large water bodies in the table the same as specified rivers for swimmability? A: No.

Confused about bundles? A: Within the bundles – M1 - what would we do first, easiest and best up take, least cost through. Effectively expect everything in M1 done then M2 might need to be done.

Do we take into account what will have the biggest / best impact on the water quality? A: Take a farmer focus - if you had to put them into your farm system, where would you put them, i.e., which would you or could you do first, then next.

Feedback - Dairy

Current practice – planting the sides of drains in lower land is really difficult, but 3m at the top of catchment easy, so it is hard to set a riparian margin distance for a typical dairy farm - need horses for courses.

Laneway run off diversion – most farmers need to do this better.

Efficient use of fertiliser should be happening now but not sure it is in all cases.

Timing of effluent application is important and difficult in lowlands. A: Yes. Pim noted there were only 90 days in the last 2 years when soil moisture has been appropriate for effluent application in the lower Kaituna, under good management practice.

No mention of herbicide use, only nitrates. What do we know about them? A: Yes nutrients are the focus here. Staff to circulate any information about agrichemical monitoring.

No cost of carbon? Model needs to understand carbon footprint. A: Yes modelling runs will include estimations about carbon emissions and could make assumptions about costs associated with that (e.g. Emissions Trading Scheme). Will do some work around that.

Critical source areas important – use appropriate language

What does growing maize in effluent block mean? A: This mitigation is supposed to relate to farms that are already growing maize – i.e., grow it where effluent irrigation has occurred. It is not saying start growing maize if they don't already.

Stand-off areas away from waterways – location? Maybe include distance from waterways?

M2: add protection of gully head, impervious (as opposed to lined) effluent ponds.

Community group member noted that when seeking consent an unlined pond is likely to get a 5yr consent, if proposing lined likely to get a 20 yr consent. Can't get a new consent without the right size.

When do effluent pond consents expire? A: Varying times, but Pim noted there is a large hump of consents in 2021 and then another in 2026.

M2 – creation of wetlands. Can we specify and area/size e.g., 1% of the area. Suggest change this to multiple areas. Whether multi small areas add to larger? A: model assumption 1% of farm area. Can certainly work on multi wetlands.

What about existing knowledge about cow genetics - recognise new science will bring more. A: some new technology which the model won't be able model as we don't know enough about effect.

M1 – recognise that some actions will be M1 on easy country but could be M2 in other situations such as where we have drains

Zero forage cropping M2 A: costs too high for M1 probably M2.

Winter milk? A: Is once a day milking a mitigation? Have talked about having a winter milk variation to a model scenario but don't want to add to a bundle if we can help it

M3 – Alum dosing is not something you would want to do long term

M3 need to note that maybe these will take time. Lee A: can capture time – can park and bring in 15 yrs for example. We can reflect longer term adoption if needed.

Where does organic / biodynamics fit? A: when he finds/receives 3 peer reviewed papers about environmental and economic outcomes we could put it in but not there yet.

Could there be an opportunity to have wider buffers with limited use – graze once a year, or cut and carry? A: unless forage is being exported off farm, Nitrogen will still be cycling, so it is not a form of mitigation.

Issue – wider buffer might not be enough to help. Going to 10m may not have any further benefit – Dairy NZ have looked at this.

Not talking about climate change here only water quality at this stage.

Could these mitigations be industry led? Santi will be taking these to industry next. We aren't focussed on how to implement them yet – could be a combination of regulation, industry leadership etc. This will come. Wilma - There would have to be industry support for good practice.

Feedback - Non-dairy pastoral mitigation bundle

Why separate for efficient fertiliser? A: technology / proof of placement of fertiliser.

What about soil testing? A: included under Olsen P levels - implied you need to test. Steph suggested wordsmithing

M2 – gorse? A: Should be done as M1 but significant cost which is why it's been put under M2.

Deer contouring fence/appropriate fencing

LUC 6 too low. A: talking about steep land >25degrees (i.e. LUC 7 and 8 only)

Should be managing gorse, makes sense to maintain useable land. A: Intended to mean eradication of gorse – so need to tweak language.

Winter grazing on needs to be considered. A: We are effectively at peak cow numbers - moving them into another part of the catchment (or another catchment) won't be an acceptable mitigation response

Stock management within the landscape – deer M1. Need to be talking 30yr in the future should be looking at milking goats, sheep, etc., maybe less cows.

M3 – alum not appropriate – short term great but not a long term option.

Is there evidence of research about alum use on pasture? A: Yes. Research referenced in the paper.

Forestry Feedback

M1 Need to consider harvesting process and buffer zones – should be consented but IS IT DONE?

Managing unplanted areas is important

When gorse is growing under trees when does it become a problem

M1 include scrutinising certified harvesters and enforcing compliance

M3 summer harvesting only

What is the land value under forestry v dairy?

Note central government drive for tree planting

Arable Feedback

M1 efficient fertiliser and Olsen P should be M0

M2 tillage should be M1 – Strip tillage. Till row not paddock

Horticulture Feedback

Only modelling kiwifruit. Not avocados.

Efficient fertiliser planning is being driven by \$ and land use type

Over fertilisation is current practice. Large water and fertiliser use to get young plants up and running.

Frost protection with water should have reduced now we've moved to G3 from Hort16 as it produces a month later

Current practice has moved to more grass under vines – slow water and nutrient loss

Need to account for contouring at the time of land use change – loss of wetlands, increased flows.

4 Baseline financial modelling

Presentation from Lee for various farming systems

Profit/ha are specific to KPW

Question / comments:

Arable profit /ha too high for current pay off

Areas required for kiwifruit compared to dairy very different

Can we update profit figures in 12 months?

5 Surface Water Quantity (starting slide 36 – Nicki & James D)

Nicki and James D introduced the approach we will be using to review surface water quantity allocation limits and minimum flows and the EFSAP tool

Purpose is to prepare the group for modelling output discussions at the next workshop.

No feedback is sought.

Refer to slides (with voice over) and hand out.

Flow duration curve explanation (slide 40)

James explained the slide and noted that EFSAP is built using flow duration curves for every river segment using River Environmental Classification (REC) segments. REC is a roadmap of all streams – based on models and data, and it includes flow information based on rainfall, catchment information and knowledge of how streams flow. Can't measure everything everywhere but do have enough.

Nicki noted that the work ahead is to consider what different min flows and allocation limits might mean for in-river values and for water users (slide 41).

We will use EFSAP as a WMA scale tool and also consider more detailed studies of flow needs for different values (slide 42). For example detailed localised information and assessment was used to set minimum flows for the TCC Waiari water take consent. There is also a cultural flows report from Ngati Makino and Ngati Rangitihia that we will need to invite them to explain so we can consider it.

James introduced EFSAP noting the indicator species that will be used in modelling and how they have different flow preferences which can be expressed with Weighted Useable

Area curves. We have picked flow hungry species to protect water for which will provide for all the less flow hungry species. Most of the work in NZ has been done on trout, now realising that other species are also really important for cultural, ecological reasons.

He then introduced example outputs of the model showing how it can depict impacts of different minimum flows on reliability of water supply for users and on habitat protection levels for fish (slides 46-51).

Decisions space diagrams are produced by NIWA to support community groups. Use them to figure out which range of allocation limits and minimum flows will provide for acceptable reliability of supply AND habitat protection.

Questions/comments

If we look at surface water allocation in winter when not under pressure is there a problem with over allocation? A: Over allocation potentially affects flow variability. Summer is generally when minimum flows are experienced AND demand for water is highest.

What about groundwater? A: Definitely will be working through this as well. Modelling is due to provide results in the next month.

How will the Kaituna River Document impact on this? A: Setting objectives that support the key values and objectives in the document, and then minimum flows and allocation that support this. Also will be having more concerted engagement with iwi & hapū.

How will you consider the minimum flow that was in the regional plan for Waitahanui and now has been replaced with 10% of Q5? A: We can explain what this was based on and show how it relates to EFSAP outputs.

In summer, temperature is the limiting factor for temperature dependant species like longfinned eels. Waiari consent didn't consider temperature well enough in my view. 23 degrees in the lower Kaituna and colder in Waiari. A: Yes, even when we provide the right flow, there will be other pressures that affect fish life, e.g., big obstacles in the river which prevent fish passage.

If you extract from a cold water source you can have a very detrimental effect on species by causing it to get warmer.

Min flows - will we also look at ingress of saltwater up rivers if we take too much? A: Model will only help with habitat protect level for fish. It won't help with water temp, saline encroachment, but we will have to look in to this separately.

Do we have enough water to make everyone use groundwater and leave surface water alone? A: We will work through this

What is the current state of consents in the catchment and timeframes? Can we have an update, including new consent applications?

A: Yes

Why 10% of Q5? Why not 15%? A: 10% is a regional interim limit. We will work on KPW specific limits.

Could flood waters be used? A: Possibly if we need to explore this. Lots of issues associated with it.

6 Summary

Steph summarised the day including actions noted, and asked about thoughts on the two groups working together. General feedback was that it worked well and should continue, but could separate for catchment specific discussions.

Questions/comments

Can we have info earlier? A: Yes, the intent is to send material 10 working days ahead of time, but sometimes this is a little out of our control. Noted that we can send material in stages as it becomes ready, rather than waiting to send it all as one package don't wait till its all ready

Can we have as much notice as possible of next workshop dates? People need time off work - 6 weeks' notice with a reminder would be good

When will we discuss groundwater and the link between current practise and lag times for nitrate? A: at one of the next two workshops.

7 Next steps

- Review decisions/ recommendations made today
- Review actions committed to
- Note next steps again

Kerry noted that at the next meeting they would agree on what will form a community group view – consensus, or in some cases a majority (noting that Council staff will record and report all alternate views). One member noted they should seek that all members have acceptable level of satisfaction to go forward, i.e., consensus. Nicki noted it is possible that there will be different view and councillors will need to understand the divergent of views.

Stephanie asked whether to progress as a combined group. The majority of members supported this. One member noted that for anything catchment specific, we could split into catchment groups within the combined workshop.

8 Actions noted

- Send out list/maps of specified rivers in the WMA
- Circulate Kaituna heavy metals report and any information on agrichemicals
- Summarise current state and trends again so group can focus on real issues in the catchment. Include what we know about lag times in groundwater.
- BOPRC to form a closed facebook space for both Kaituna and Pongakawa-Waitahanui Community Groups combined. It will be for members to discuss issues with each other. BOPRC will not be convening it and may not monitor it regularly - questions for Council should still be emailed via the chairs or raised at workshops.
- BOPRC to provide update on water take consents and current state at a future workshop

Chair's final comments: Wilma: Enjoyed combined workshop and broader discussion. Barry: Thanked councillors for coming as the topic is really important and the discussion is moving in to the hard stuff. Thanked Lee for his input.

Geoff closed the workshop with a karakia, noting beforehand that can't wait to get to the final document.

Appendix 1 – Community group amendments to draft mitigation bundles

These tables reflect community group feedback. Further amendments may be made following Council discussions with industry organisations.

Dairy				
MO – Current Practice (most properties already doing this mitigation)	MI – Mitigation One (less impact & <u>lower cost</u>)	M2 – Mitigation Two	M3 – Mitigation Three (Greatest impact & greatest cost)	Outliers
	Appropriate weather dependent grazing	Full stock exclusion from medium size waterbodies and 3m planted buffer	Stock excluded from, and planted buffers adjacent to, a wider range of waterways (e.g.: ephemeral, seeps, small streams) critical source areas	New science
Full stock exclusion from all large waterbodies, all wetlands and 3m planted buffer, slope dependent		Detention bunds	Restricted grazing (with barns) 1	Technology
Pond size	Stand-off areas, location ?m from ??	Complete protection of gully heads Ask which stream feeding 1	Partial afforestation of easier contoured land	Organics, Biological options
	Relocation of troughs and placement of feeding equipment *	Reductions in seasonal stocking rate 2	Reducing stock rates 2	Wider buffers with grass for harvest quarterly
Adoption of low N leaching forages Coming??		Controlled grazing with stand-off pads	Alum applied to pasture (short term only)	
	Reduced tillage practices 1	Reducing fertiliser N use	Denitrification beds 3	
	Laneway run-off diversion *	Impervious effluent storage 3 As consents due	Adoption of new irrigation infrastructure	
	Efficient fertiliser use: 2 Maintain optimal Olsen P	Increase effluent application area		

	Improved nutrient budgeting Use of plant growth regulators (to replace N)			
Efficient irrigation practices (soil moisture monitoring)		Creation of new wetlands (1-2% of farm) Moved from M3		
	Grow maize on effluent blocks	Cow and plants genetics for low N		Nil grazing M4
	Timing of effluent 3 application in line with soil moisture levels (assumes sufficient storage)	Zero brassicas forage cropping		Once a day milking M4
	Herbicide use	Laneway diversion on flats		
	Catch crops i.e: swedes			

	MO – Current Practice [Most properties already doing this mitigation]	M1 – Mitigation One [Less impact and lower cost]	M2 – Mitigation Two	M3 – Mitigation Three [Greatest impact and greatest cost]	Outliers						
Non-dairy pastoral		<table border="1"> <tr> <td style="writing-mode: vertical-rl; transform: rotate(180deg);">Managed</td> <td>Full stock excl. <u>all</u> waterbodies and 3 m buffer.</td> </tr> <tr> <td></td> <td>Efficient fertiliser use.</td> </tr> <tr> <td style="writing-mode: vertical-rl; transform: rotate(180deg);">Dependent</td> <td>Stock class management within landscape [Dairy cows shipped out for winter]</td> </tr> </table>	Managed	Full stock excl. <u>all</u> waterbodies and 3 m buffer.		Efficient fertiliser use.	Dependent	Stock class management within landscape [Dairy cows shipped out for winter]	Full stock exclusion (mdm streams) and 3 m buffer.	Stock excluded from and planted buffers wider range.	Managed grazed grass length.
Managed	Full stock excl. <u>all</u> waterbodies and 3 m buffer.										
	Efficient fertiliser use.										
Dependent	Stock class management within landscape [Dairy cows shipped out for winter]										
		Stock reticulation away from surface waterbodies.	Creation of new wetlands.								
		Reductions in seasonal stocking rate.	Reducing stocking rates.								

		Appropriate gate track and race placement	Convert LUC 6-8 pasture – forest/manuka	Alum applied to pasture.	
		Some no tillage practices.	Detention bunds.	Buffer around excluded waterways (7 m) <u>OR</u>	
		Maintain optimal Olsen P.	Complete protection of gully heads.		
		Targeted space planting of poles.	Whole paddock space planting of poles.		
		Relocation of troughs.	Management of gorse. Changing stock ratios to reflect N leaching potential.		
Arable	Maintain optimal Olsen P Reduced tillage practices Efficient fertiliser use <i>New varieties</i>	<i>Complete protection of gully heads</i> Manage risk from contouring Cover crops between cultivation cycles Grass or planted buffer strips Complete protection of existing wetlands	Swales	Strip tillage Reducing fertiliser N use Creation of new wetlands Sediment traps	<i>High supplement use on young plants</i> <i>Monitor contour consents</i>
Forestry	<i>Waterway buffers</i>	Management of gorse Laneway runoff diversion Complete protection of existing wetlands <i>More bunding</i>		<i>Creation of new wetlands</i> <i>Staged harvesting on hill sides</i>	<i>Enforcing compliance on tracking</i>
Horticulture		Complete protection of existing wetlands Laneway runoff diversion Maintain optimal Olsen P Efficient fertiliser use <i>Gullies in between – detention bunds</i>			<i>Herbicide control</i>

		<i>Fert plan</i> <i>Grass under canopy</i>			
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