

Memo

Date	24 August 2018
To	Orari-Temuka-Orari-Pareora Zone Committee
CC	Dan Clark, Melissa Robson,
From	Craig Davison, Lyn Carmichael, Shirley Hayward

Subject: Achieving the Recommended Water Quality Outcomes for Nitrates in the Orari-Temuka-Orari-Pareora Zone

Purpose

The purpose of this paper is to:

- a. Provide the ZC with a recap on the current state of ground and surface water resources in the Orari-Temuka-Orari-Pareora Zone and the water quality recommendations in the Draft Zone Implementation Programme Addendum (dZIPA) to maintain or improve water quality;
- b. Provide the ZC with a recap on the feedback that was received on these recommendations and detail the changes to these recommendations that have been made in response to the feedback received;
- c. Provide the ZC with a recap on the concept of a stepped regime as a framework for managing the nitrate hotspot areas;
- d. Provide the ZC with options for a stepped regime for inclusion in the OTOP dZIPA that specifies the magnitude of the percentage reductions required and the land uses the percentage reduction will apply to, to take out for further consultation in September;

Background

The current state and trends of freshwater resources in the Orari-Temuka-Orari-Pareora Zone has been investigated in detail by Hayward, Clarke, Dynes, Barnden, Arthur & Barbour, 2016, and Zarour, Aitchison-Earl, Scott, Peaver & DeSilva 2016. In summary, freshwater quality across the zone generally meets the required water quality standards for nitrates under the National Policy Statement for Freshwater Management 2017 (NPSFM) and the New Zealand Drinking Water Standards 2008 (NZDWS). The exception to this is three nitrate hotspot areas in Rangitata Orton, Fairlie Basin and Levels Plains (Appendix One) where nitrate concentrations in freshwater resources exceed the national bottom line for ecosystem health as specified in the NPSFM and/or average groundwater concentrations exceed half the Maximum Acceptable Value (MAV) under the NZDWS for drinking water (and multiple bores exceed the MAV).

The findings of the current state reports and supplementary papers by Hayward 2018, and Hayward and Scott 2018, underpin the water quality recommendations currently in the OTOP dZIPA. These

reports and memoranda highlight that nitrate concentrations in shallow groundwater¹ in the Rangitata Orton, Fairlie Basin² and Levels Plains hotspot areas currently exceed half the NZDWS Maximum Acceptable Value (MAV) of 11.3 mg/L as an annual average. In the Rangitata Orton hotspot area, Rhodes Stream and Old Orari Lagoon currently exceed the nitrate toxicity for ecosystem health National Bottom Line under the National Policy Statement for Freshwater Management (NPS-FM) of 6.9 mg/L as an annual median.

As part of the development of the dZIPA, current pathway scenario assessments were undertaken to quantify the improvements in water quality expected to be achieved through the implementation of Plan Change 5 (PC5) to the Land and Water Regional Plan (LWRP), and application of Baseline Good Management (GMP) Loss Rates³ for consented farming activities. The assessments illustrated that, despite the implementation of PC5, because of current upwards trends in nitrate concentrations in the shallow groundwater resources in the Fairlie Basin, Rangitata Orton and Levels Plains hotspot areas would continue to exceed half the MAV, and nitrate concentrations in lowland streams in the Rangitata Orton hotspot area would continue to exceed the National Bottom Line for ecosystem health.

Good Management Practice and Resource Consenting Triggers under Plan Change 5

Properties greater than 10 hectares in area with greater than 50 hectares or more of irrigation, or greater than 10% of the area of a property in intensive winter grazing of cattle are required to obtain a land use consent under PC5. From 1 July 2020, those properties are required to have a nitrogen loss calculation⁴ that does not exceed the Baseline Good Management Practice Loss Rate⁵, as estimated by the Farm Portal. The Baseline GMP Loss Rate effectively becomes a property's nitrogen loss limit. PC5 also defines Good Management Practice (GMP) as the practices described in the booklet titled "Industry-agreed Good Management Practices related to water quality" released in September 2015.

A majority of the land use consents for farming within the OTOP zone will expire in 2025, and farmers will therefore be required to farm within their Baseline GMP loss rates on renewal of these consents from 2025 onwards.

¹ <20 metres deep

² Renamed from the Ashwick Flat Hotspot Area through feedback received on the dZIPA

³ The modelled expected GMP reduction in nitrate losses applied to these scenarios was 15%, which was based on the MGM estimates of the gains in implementing good management practices in intensively farmed/irrigated areas.

⁴ Means the discharge of nitrogen below the root zone, as modelled with Overseer, averaged over the most recent four year period and expressed in kg per hectare per annum.

⁵ Means the average nitrogen loss rate below the root zone, as estimated by the Farm Portal, for the farming activity carried out during the nitrogen baseline period (2009 – 2013) if operated at Good Management Practice.

Zone Wide Water Quality Recommendations in the dZIPA

The current water quality recommendations in the dZIPA for nitrates are set out in Section 4.8.1 – Water Quality Outcomes as follows:

Water Quality Outcomes

I. No Deterioration of Water Quality:

- a. Where existing freshwater quality is already better than any outcome set out in this ZIPA, there shall be no deterioration of that water quality.

II. Groundwater:

- a. Annual average nitrate nitrogen concentrations in groundwater within each FMU, excluding the hot spot areas of Rangitata Orton, Levels Plains, and the Fairle Basin, shall not exceed 5.65 mg/l, which is half the Drinking Water Standards for NZ Maximum Allowable Value of 11.3 mg/l.

III. Surface Water:

- a. Nitrate concentrations in individual spring-fed streams shall not exceed 6.9 mg/l as an annual median.

The ZC made these recommendations with a two-tiered approach. Firstly, the expectation of clause (I)(a) is that there will be no further deterioration of freshwater resources where recorded nitrate concentrations are currently met, or are better than, the recommended nitrate limits for ground and surface water as set out in clauses (II) and (III). Secondly, where these outcomes are not currently being met in the hotspot areas, the recommendations set out in clauses (II) and (III) are targets that should be met over defined timeframes as set out in the Freshwater Management Unit (FMU) specific sections of the dZIPA. Tables 1 and 2 summarise these recommendations for ground and surface water resources across the zone.

The recommendation for ½ the MAV as an annual average was made on the basis that groundwater nitrate concentrations are seasonally variable and setting outcomes at half the MAV will broadly protect against exceedances of the MAV (Scott, 2017). The recommendation of the National Bottom Line for nitrate toxicity for ecosystem health of 6.9 mg/L was made on the basis that significant percentage reductions beyond GMP in accordance with PC5 will be required to achieve this limit in the Rangitata Orton hot-spot area.

Table 1 OTO draft groundwater nitrate limits and targets

Groundwater Province* ¹	Current state average (2012-2017) (mg/L)	Limit Annual average nitrate nitrogen (mg/L)	Target Annual average nitrate nitrogen (mg/L)
Geraldine	2.8	5.65	
Opihi	4.7		
Orari	2.7		
Pareora (lower)	2.6		
South Branch Pareora	Insufficient data available		
Taiko Stream			
Te Ngawai			
Timaru			
Upper Pareora			
Nitrate hot spot areas			
Fairlie Basin	6.9		5.65
Levels Plain	6.3		
Rangitata-Orton	8.4		

^{*1} see Appendix 2 for map of groundwater provinces

Table 2: Draft spring-fed stream nitrate limits and targets

FMU	Site Name	Current state	Recommended Limit	Recommended Target		
		5 year median (mg/l)	Annual median (mg/l)	Annual median (mg/l)		
Orari	Petries Drain Canal Road	5.1	6.9 Where water quality is better than this limit, water quality shall not deteriorate below its existing state			
	North Branch Ohapi Creek Guild Rd	0.8				
	Ohapi Creek Guild Rd	0.8				
	South Branch Ohapi Creek Guild Rd	1.1				
	Ohapi Creek Above Orari Confluence	0.8				
	Coopers Creek SH72 Bridge	1.2				
	McKinnons Stream Wallaces Bridge	5.1				
	Coopers Creek SH72	1.2				
Temuka	Smithfield Creek Te Awa Rd	4.2				
	Taumatakahu Stream Murray St	1.5				
	Raukapuka Creek Coach Road	1.9				
Opihi	Orakipaoa Creek Milford Lagoon	1.5				
Nitrate concentrations exceed national bottom line						
Orari	Old Orari Lagoon Outfall	9.1		6.9		
	Rhodes Stream Parke Road	8.9				

Hotspot Specific Water Quality Recommendations in the dZIPA

The current water quality recommendations in the dZIPA for achieving the zone wide water quality outcomes described above are set out in Sections 5.1 (Orari FMU), 5.3 (Opihi FMU), and 5.4 (Timaru FMU). The dZIPA released in December 2017 contained a recommendation for the Rangitata Orton, Levels Plains, and Fairlie Basin hotspot area as follows:

“If the water quality outcomes are not met within 10 years of the OTOP sub-region plan change becoming operative, diffuse discharges of nutrients from farming activities, will be required to reduce nitrogen losses beyond Baseline GMP Loss Rates. Based on current state, this reduction could be in the order of 30 – 40% for the Rangitata Orton hotspot area, 10 – 30% for the Levels Plains hotspot area, and 10-20% for the Fairlie Basin hotspot area. If the zone-wide water quality outcomes are not met within 10 years of the OTOP sub-region plan change becoming operative, diffuse and point source discharges from industrial activities will be required to reduce losses over time to achieve water quality outcomes.”

The feedback received on these recommendations during the February consultation period was substantial and largely supportive, in principle. However, a greater level of certainty was sought on what the recommendation would translate to in a regulatory context; what land uses will this effect, how many percentage reduction steps beyond GMP will apply, and at what time intervals. While some feedback also sought a shorter timeframe for commencement of the staged approach, it should be noted there was also some feedback opposing reductions beyond GMP.

In consideration of this feedback, the ZC amended their recommendation and it now reads as follows:

“Where the zone-wide water quality outcomes specified in Recommendations 4.8.1 (II) and (III)(a) for ground and surface water are not currently being met, establish a stepped regime within the plan change that will require diffuse discharges of nitrogen from farming activities to be reduced beyond Baseline GMP Loss Rates and diffuse and point source discharges from industrial activities to be reduced beyond current consented loss rates. Based on assessments of current water quality, the total reduction of nitrogen discharges required to meet water quality outcomes is 30-40% in the Rangitata Orton Hotspot Area, 20 – 30% in the Levels Plains hotspot area, and 10-20% in the Fairlie Basin hotspot area, beyond those likely to be achieved by the implementation of Baseline GMP under Plan Change 5.

Regional council continues to support non-statutory measures for nitrogen reductions beyond Baseline GMP Loss Rates in order to achieve water quality outcomes.

Regional council shall monitor water quality outcomes and conduct a review within 5 years of the OTOP sub-region plan change becoming operative to evaluate the efficiency and effectiveness of measures to achieve water quality outcomes.”

Farmer Reference Group Investigation of Nitrate Reductions

A farmer reference group was established by the Zone Committee to investigate the options and consequences for further reductions in N losses beyond Baseline GMP for farm systems within the OTOP Zone (Fietje, 2018). A key finding of this group was that dairy systems are able to reduce nitrate losses, within their current farming systems and without adopting land use change, if the requirement to reduce is within 10-15% beyond Baseline GMP. No opportunities for further reductions beyond Baseline GMP were found for other land uses within the zone and the options available for dairy were not without significant increases in management complexity and in some cases cost. The mitigations for N loss considered feasible for dairy systems in OTOP, and crucially those able to be captured in Overseer modelling, were changes to the nitrogen content of supplements and/or the removal of dairy stock from pasture by use of standoff pads.

Stepped Approach for Nitrate Reductions to Achieve Water Quality Targets

A stepped approach for managing the nitrate hotspot areas and achieving the water quality targets was introduced by Carmichael and Davison, 2018 in a ZC workshop on 11 June. This memorandum set out a potential stepped reduction regime in each hotspot area staged in ten percent steps at five yearly intervals to meet water quality outcomes as longer-term targets. In acknowledgment of the cost likely to be associated with achieving Baseline GMP in 2025, the first stepped reduction beyond Baseline GMP for land use consents to farm would apply at year 2030.

In response to councils statutory requirements and ZC recommendations a monitoring programme will be implemented to inform future State of the Environment Monitoring, efficiency and effectiveness evaluations of the OTOP plan change and targets and outcomes set by the ZC. A core component of the monitoring programme will be to determine if the planned future stepped percentage reductions beyond GMP, as established based on current science, would still need to apply to meet the water quality targets, or whether lesser or greater percentage reductions would be required as a result of new science.

The policy framework could further support this direction by requiring that land use consents to farm are granted with durations not exceeding ten years and would therefore only adopt one percentage reduction step beyond the current step. This would enable the renewal of farming land use consents to be relative to the five-yearly monitoring and ten yearly plan review cycle, and would ensure the percentage reduction steps are relative to the future state.

Examples of Stepped Regimes for Meeting Water Quality Targets for Ground and Surface Water in Canterbury

The concept of reducing nitrogen losses beyond what can be achieved through the implementation of good management practices is not a new concept. In both the Selwyn Waihora and Hinds Plains zones

(Plan Change 1 (PC1) and Plan Change 2 (PC2) to the LWRP respectively), the sub regional planning processes resulted in properties being required to achieve a rate of nitrogen consistent with good management practice for the properties baseline land use by 2017. Percentage reductions of up to 30% beyond good management practice as defined in these plan changes will apply at different time intervals to achieve the water quality targets for those zones.

PC1 and PC2 were developed ahead of the industry agreed Good Management Practices (GMP) that have been incorporated into the LWRP through PC5. Therefore, it is important to note that the first step of achieving good management practice in Selwyn Waihora and Hinds is a much smaller reduction from baseline land use in contrast with meeting a Baseline GMP Loss Rate as estimated by the Farm Portal by 2020 under PC5.

Comparison of Good Management Practice under PC1, PC2 and PC5

During the development of the ZIPA for Selwyn, good management practice was considered to be the use of nutrient budgets, stock exclusion and compliant effluent systems. In Hinds it was also considered to be the inclusion of a reduction in fertiliser application on crops following large winter depositions of nitrogen, installation of 30+ days effluent storage for dairy operations and a reduction in nitrogen fertiliser use when effluent has been applied to land.

Good Management Practice under PC5 was defined by the Matrix of Good Management project as the practices described in the September 2015 document “Industry-agreed Good Management Practices relating to water quality”. The practices considered as good management practice for earlier plan changes have been incorporated, as have many of the mitigations for N loss scoped to achieve reductions beyond good management practice for these prior stepped regimes. This is particularly so for the reductions in leaching losses able to be achieved by the efficient use of irrigation and fertiliser.

The Baseline Loss Rate, which is a property’s nitrogen losses during the baseline period if the property were operating at GMP, is estimated for each property by adjustments made to the properties Overseer files for the 2009-2013 baseline years, calculated through the Farm Portal.

Implications of setting differing reductions by land use on timeframes for achieving targets

The stepped reductions adopted for the Selwyn Waihora and Hinds plan processes included different levels of reductions for each represented land use, acknowledging the differing implications of % reductions on farm operating profit across land use classes. The % reductions for the Selwyn process were set at a rate for each land use that was considered to equate to an average loss of 8% of the farm operating profit.

The implications on the overall timelines for achieving water quality outcomes of setting differing requirements for reductions in N loss for different land uses will depend on the loads for each

represented land use in the three hotspot areas. These implications are highlighted and discussed further in the economic assessment memo accompanying this paper.

Recommendation

The Zone Committee establishes a pathway for achieving nitrate water quality targets for ground and surface water in the three hotspot areas by requiring consented farming activities to further reduce nitrogen losses beyond GMP, with a first step reduction in 2030.

References

Fietje, L., Carmichael, L. (2018). Farmer Engagement in Farming Within Limits. In: Farm environmental planning – Science, policy and practice. (Eds L.D. Currie and C.L. Christensen). <http://flrc.massey.ac.nz/publications.html>. Occasional Report No.31. Fertiliser and Lime Research Centre, Massey University, Palmerston North, New Zealand.

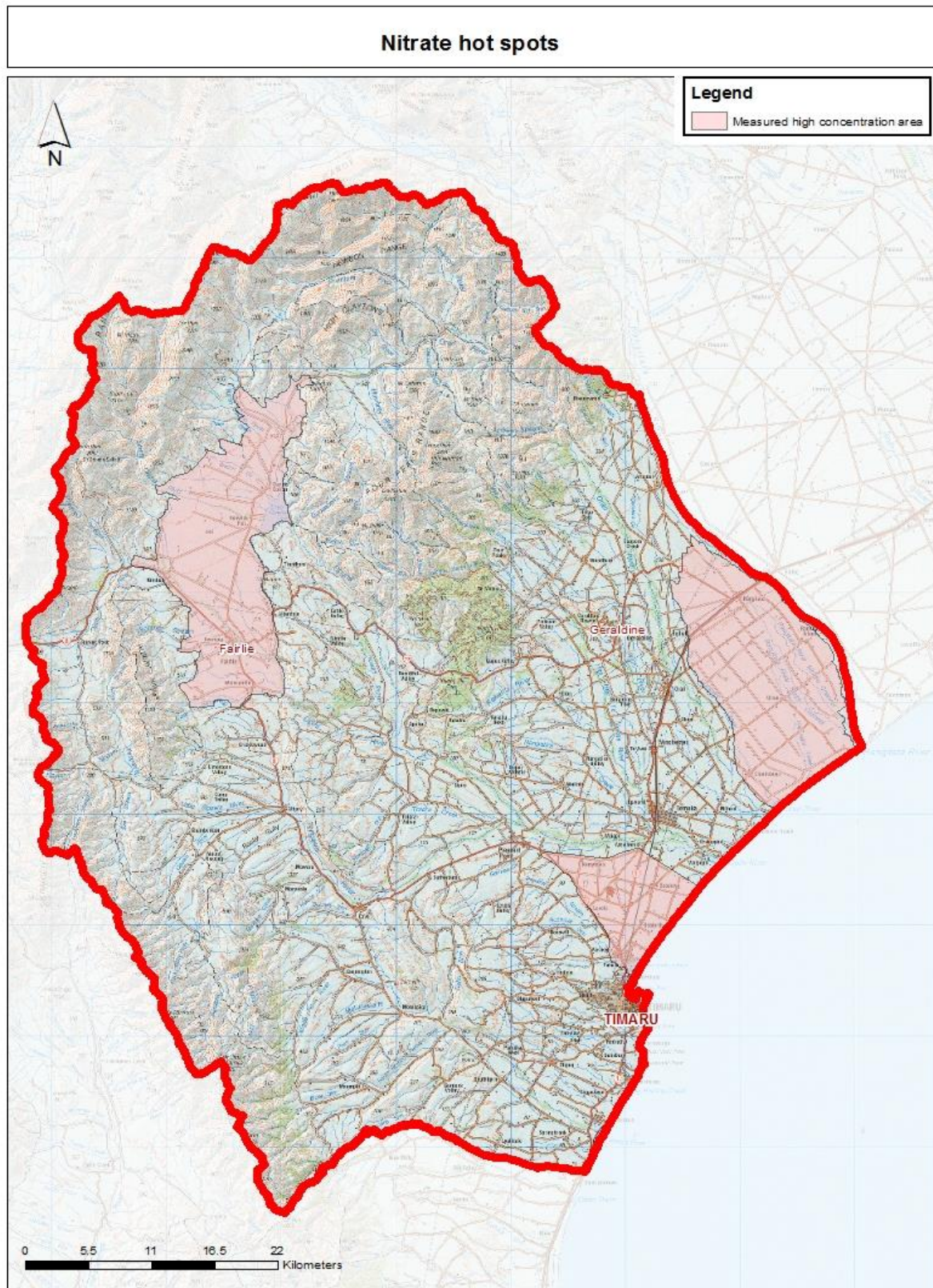
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Scott, M. 2017: Reductions in OTOP nitrate loads to meet the drinking water maximum acceptable value. Memorandum dated 17 August 2017.

Scott, M. Hayward, S: Delineation of areas with high nitrate concentrations, reductions to meet targets and monitoring options. Memorandum dated 17 August 2017.

Zarour, H., Aitchison-Earl, P., Scott, M., Peaver, L., DeSilva, N., 2016. *Current state of the groundwater resource in the Orari-Temuka-Opihi-Pareora (OTOP) Zone*. Environment Canterbury Report No. R16/41

Appendix One – Orari-Temuka-Orari-Pareora Hotspot Areas



Appendix Two – Map of Map of OTOP groundwater provinces and nitrate hotspot areas

