



Submission on an application for a water conservation order for Te Waikoropupū Springs and associated water bodies (Form 30).

About this application

Ngāti Tama Ki Te Waipounamu Trust and Andrew Yuill (the applicants) have lodged an application with the Minister for the Environment for a water conservation order (the Order) for Te Waikoropupū Springs and associated water bodies (the application). The application concerns the following water bodies: the confined and unconfined Arthur Mable Aquifer; Te Waikoropupū Springs; the Takaka River and its tributaries, including the Waingaro, Anatoki and Waikoropupū Rivers; and hydraulically connected groundwater including the Takaka Limestone Aquifer and Takaka Unconfined Gravel Aquifer. The outstanding values identified by the applicant are: significance in accordance with tikanga Māori; outstanding cultural and spiritual values; visual clarity values; scientific and ecological values; biodiversity values; habitat for aquatic organisms and indigenous stygofauna; habitat for indigenous fauna; habitat for indigenous flora; recreational values; and wild, scenic and natural characteristics. The Applicants seek protection of these values through a number of conditions contained in a draft order appended to the application.

If you want to make a submission to the Special Tribunal, you must make sure the EPA receives it by 4pm on the 28th February 2018.

1. How can we contact you?

First name:	Heather
Surname:	Wallace
Organisation (if applicable):	Friends of Golden Bay Inc
Email address:	[REDACTED]
Telephone number(s):	[REDACTED]
Postal address:	[REDACTED]

Please note, if you have provided your email address we will use this as your address to contact you.

2. Which parts of the application does your submission relate to?

Please tell us the specific parts of the application your submission relates to. If you require additional space, please attach further pages clearly numbered and labelled with your name.

All of the application. See attached. See Appendix 1 p1-4 and p. 1-3 submission.

3. What is/are your view/s on the application?

Please select one or more:

<input checked="" type="checkbox"/> Support	<input type="checkbox"/> Support but prefer to preserve a different but related water body in the same catchment ¹	<input checked="" type="checkbox"/> Support but prefer to preserve different features and qualities of the water body ¹	<input type="checkbox"/> Oppose ²	<input type="checkbox"/> Neutral
---	---	--	--	----------------------------------

Please provide details. If you need more space, please attach further pages clearly numbered and labelled with your name.

See appendix 1 p1-4 submission p1-3.

¹ In giving reasons for these preferences, you must refer, if practicable, to the matters set out in sections 199, 200 and 207 of the Resource Management Act 1991. You must also describe the provisions that you think should be included in the Order and the effects that those provisions would have on the water body.

² *If you oppose the Order, you must give reasons why you consider that the Order is not justified in terms of sections 199 and 207 of the Resource Management Act 1991.

Water Conservation Order: Te Waikoropū Springs Submission Form

4. What would you like the Special Tribunal to recommend to the Minister for the Environment?

Please select one or more:			
<input checked="" type="checkbox"/> Grant the Order	<input checked="" type="checkbox"/> Grant the Order with changes	<input type="checkbox"/> Decline the Order	<input type="checkbox"/> Neutral
Please provide details (including the general nature of any changes sought to the Order). If you need more space, please attach further pages clearly numbered and labelled with your name.			
see submission p1-3 appendix p1-4			

5. Would you like to present your views on this submission to the Special Tribunal at a public hearing?

Please select one or more:		
<input checked="" type="checkbox"/> I/we want to present my/our views at a public hearing.	<input type="checkbox"/> I/we do not want to present my/our views at a public hearing.	<input type="checkbox"/> If others make a similar submission, I/we would consider presenting a joint case with them at a public hearing

6. Your signature, or signature of person authorised to act on your behalf

Heather M. Wallace - Sec. FOGB Inc. 25.2.18.

Signature

Date

Please note that a signature is not required if you make your submission by electronic means

Important notes to submitters

- The EPA is receiving submissions on behalf of the Special Tribunal. Your submission **must be received by the EPA by 4.00 pm, 28th February 2018**;
- A copy **must also be sent to the applicants** as soon as practicable after you have served your submission on the EPA;
- It is important to use the EPA submission form, so that you are aware of important issues about your privacy. If you intend to use an alternative form, please contact the EPA on 0800 401 673.
- The Special Tribunal may require you to provide **further information** on your submission.

Using the [online tool \(www.epa.govt.nz/wcpsubmit\)](http://www.epa.govt.nz/wcpsubmit) is the easiest way to make a submission. When you use this tool, you will be emailed a copy of your submission. Please ensure you send a copy of your submission to the applicant via this email address; rosie.hill@al.nz. If you cannot use our online form, please post or email a copy to the EPA [and](http://www.epa.govt.nz) to the applicant:

EPA contact details (receiving submissions on behalf of the Special Tribunal)	Applicants contact details (must receive a copy of the submission)
Waikoropupu@epa.govt.nz Please include 'Submission: (your name), Water Conservation Order for Te Waikoropū and Associated Water Bodies' in the subject line.	rosie.hill@al.nz Please include 'Submission: (your name), 'Water Conservation Order for Te Waikoropū and Associated Water Bodies' in the subject line.
Attention: Water Conservation Order Team Environmental Protection Authority, Private Bag 63002, Waterloo Quay, Wellington 6140, New Zealand.	Attention: Rosie Hill Anderson Lloyd, PO Box 201, Queenstown 9348, New Zealand.

Privacy statement

When you complete your submission, you authorise us to use it to administer a public process. This means your private information may be used in the public domain. By completing this submission form you authorise the EPA to use your personal information and your submission in the following ways. Personal information means your physical address, email address and phone number, unless otherwise stated.

What we will do with your submission:

- Provide a full copy, including your personal information to the Board of Inquiry, the applicant and other parties directly involved.
- Keep a copy at our offices at 215 Lambton Quay, Wellington.
- We will publish a copy, which does not contain your personal information, on our website.
- We may release a copy, which does not contain your personal information, under the Official Information Act 1982 (OIA) if a request for that information is made to us.

What we will not do with your submission

- We will not publish your personal information on our website.
- We will withhold your personal information from release under the OIA subject to the provisions of the OIA.

If you do not wish for all or part of your submission to be published on our website or released under an OIA, including personal information other than your address, email address and phone number, you must tell us in your submission.

Submission Te Waikoropupū Aquifer Water Conservation Order.

Introduction

Friends of Golden Bay Inc.(FoGB) have a long history of environmental care and sustainability issues for Golden Bay, since 1995 and have a membership of around 100 people. The Society’s main objectives are:

- a) To work for the protection and enhancement of the Golden Bay environment.
- b) To foster natural resource management in the Golden Bay district.

We have been concerned with freshwater issues in Golden Bay for about 5 years. From February 2016 we have been taking weekly water samples from Te Waikoropupū Springs and Fish Creek, primarily for nitrate and phosphate analyses. More recently we have also been measuring *Escherichia coli* in Fish Creek. This work has been paid for by donations and has been a major commitment in time. A report on the nitrate results is given in Appendix 1.

Support for the Water Conservation Order:

The waters of Te Waikoropupu are outstanding (see Section B of WCO). To that end FoGB fully supports Ngāti Tama Ki Te Tau Ihu and Andrew Yuill's application for a Water Conservation Order on Te Waikoropupū springs and associated waters.

Te Waikoropupū embodies much of what it means to live in Golden Bay - its special waters, unique biodiversity, importance to Māori and particularly to Ngāti Tama, its history and its tourism potential. Te Waikoropupū means a lot to Golden Bay people and to visitors; it is a treasure to be visited and appreciated. There is nothing to rival this and it is imperative we protect it for the future. We are very concerned with changes that have and are continuing to happen. This WCO would go a long way to protecting these beautiful Springs and associated waters into the future. The unknown and outstanding ability of the living system in the aquifers, which cleans and protects these water bodies, should be given the highest protection we are able to give it.

Considerations for the Tribunal

There are a few considerations regarding this WCO we would like the Tribunal to consider (**WCO Appendix1**).

1. For over 2 years FoGB have monitored water flowing to and inthe Springs every week. This has built a truly reliable and timely set of data to base decisions on (see FoGB Appendix 1). This data is shared with interested parties including TDC. The need for such data was identified in Takaka FLAG meetings but TDC was unable to fund the project. FoGB have spent over \$20,000 on water monitoring, all funded by donations from private people in Golden Bay.

A better understanding of water quality and pollution in the catchment is urgently needed. So are systems to detect and react promptly to changes in water quality.

A brief report on the nitrate-N results from this two years of weekly monitoring is attached as Appendix 1.

In summary, this research has shown:

- Nitrate-N in both Springs and in both aquifers are close to or above the trigger level proposed by NIWA (See WCO section B5.2).
- Nitrate concentrations are lower in Fish Springs and in the Shallow aquifer than in the Main Spring and the Deep Aquifer part of this complex system.
- Nitrate-N concentrations, particularly in Fish Spring, show significant seasonal effects. This has not been apparent in the long-term data in the GNS groundwater monitoring programme.
- Nitrate-N concentrations and nitrate discharged from the Springs has increased over the two years of the study but not in a linear or steady manner.
- A third of the nitrate leaving Te Waikoropupū Springs comes via the shallow system while most comes via the deep aquifer system. This conclusion is based on the conceptual model given by Stewart and Thomas (2008).

We would like to see continued monitoring and enforcement as conditions of this order as proposed in the WCO Appendix1. This should include monthly water quality and flow measurements in the Main and Fish springs; the Takaka river at Harwood and Kotinga and the Waingaro river at Hanging rock and Anatoki River at Happy Sams. These will measure both river input and outputs to the system. Currently Main Spring is monitored quarterly by GNS and TDC sample Fish Spring at the same time. TDC currently monitors Kotinga on a monthly basis. Unfortunately TDC has discontinued sampling water for analysis at Harwood and Hanging Rock but they do measure flow rates and rainfall there. Minimally the measurements should include nitrate, phosphate, *E coli*, water clarity and dissolved oxygen. Water clarity may be more of a problem in the Main Spring although we are told it is currently being assessed as part of a short-term research project.

As water is valuable and a public resource, any monitoring data must be available publicly.

It is unfair that water consents holders benefit from their privilege while water monitoring costs and the downstream effects by others. FoGBay ask that water consent holders are charged a levy to fund effective monitoring.

2. Farm management plans should be based on industry best practice and include nutrient management plans. The sale and application of fertilizers should be controlled activities and

recorded in a public record. Currently this is unavailable so their impact cannot be assessed. Grazing to riverbanks, pugging of soils, rivulets across farms, topsoil loss, sediments and mud in rivers all cause nuisance to others and pollute the waterways. They need to be managing so there are no unobserved adverse effects. Deep bores into the AMA are potentially able to allow pollution into it, so need special conditions and careful monitoring.

Any costs associated with these should be borne by farmers.

3. There should be no further allocation of water. Installing of irrigation systems is extremely expensive and this results in farming intensification. No farmer will put irrigation onto their farm without recouping the benefits from intensified farming. Farming intensity can include genetics, cow and herd size, length of milking time, supplementary feed as well as irrigation. They are an inseparable package. Already the nitrates concentrations in the Main Spring exceed the limits NIWA provided to the WCO.

We do not know enough, apart from their astonishing ability to clear the water, about the endemic organisms in the aquifer system. Hence a precautionary approach must be taken in setting nutrient and other limits to protect the stygofauna and other organisms. The WCO is the appropriate mechanism to ensure there is no further degradation.

4. The Cobb dam should be bound by the WCO also. When there are any changes in their management practices, their effects need to be monitored and, if required, controlled.

5. The underground cave systems need the highest protection that can be afforded. We are only just coming to awareness of the beautiful, complex and internationally important wonderland that exist in this cave system under the Takaka valley.

6. FoGB wish the entire catchment to be included in the WCO. We agree that all effects are cumulative.

FoGB are pleased to see this WCO proposed for Te Waikoropupu aquifer and support it entirely.

We wish to be heard at the hearing for this order.

Heather Wallace Sec. FoGB.

Appendix I

Friends of Golden Bay research at Te Waikoropupū Springs

(Report by Dr D J Mead)

Friends of Golden Bay have undertaken weekly water sampling of Te Waikoropupu springs since February 2016. This has been paid for by donations. The main aim was to accurately characterize the nitrate-N status of both the Main and Fish Springs; Fish Creek where it enters the Reserve above the springs was also studied. Samples were sent to Geological and Nuclear Sciences (GNS) for analysis as they run the nationwide groundwater quality monitoring programme. Our data has been made freely available.

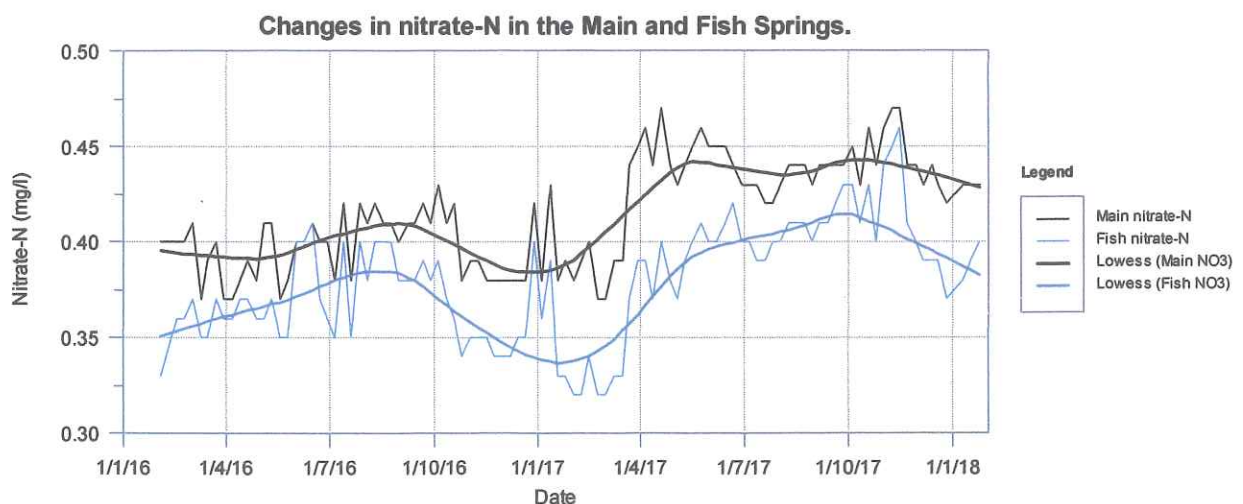
In addition to nitrate we also measured, each week, dissolved reactive phosphate and recorded conductivity and water temperature. Dissolved reactive phosphate concentrations were low at about 0.005 mg/l in both Springs; farm runoff of both nitrate and phosphate was seen in Fish Creek. Chloride concentrations have been measured less frequently. Since November 2016 we also have measured *E. coli* in Fish Creek during rain events. *E. coli* in Fish Creek were very high after rain, provided cows were present on the farms. *E. coli* were not present in the Main Spring.

In this submission we are focussing on the nitrate results in the Springs but, if requested, we are happy to provide the Tribunal with our other results.

Nitrate-nitrogen in Te Waikoropupū Springs

Samples have been collected weekly and sent to GNS for analysis. Figure 1 summarises the changes measured over a two year period.

Figure 1: The change in Nitrate-N over two years in the Springs – sampled weekly.



The lowess curves (25% of points) explain 70 and 66% of the variation for the Main and Fish Springs, respectively.

Nitrate-N concentration was higher in the Main Spring than Fish Springs. This was unexpected as other measurements made in Fish Creek had found the reverse but we found that this was due to different chemical analysis techniques between laboratories.

There were significant seasonal (summer, autumn, winter, spring) effects over the two years of data. For the Main Spring these were significant at $P = 0.035$ and the median concentrations were 0.40, 0.41, 0.42 and 0.43, respectively. For Fish Spring the seasons were significant at $P = 0.0000$, and the medians were 0.36, 0.37, 0.40, and 0.395 mg/l, respectively. The lower summer concentrations are readily apparent in Figure 1.

Figure 1 also indicates that there is a sudden increase in nitrate-N concentrations after mid-March 2017. The Mann Whitney one way analysis of variance comparing the concentrations before and after 19th March 2017 was very highly significant ($P < 0.0000$) for both the Main and Fish Springs. The median, means and standard deviations (SD) illustrate that both Springs rose by the same amount, although Fish Spring was consistently lower than the Main Spring (Table 1 and Figure 1).

Table 1: The change in nitrate-N in the Springs after mid-March 2017

	Median (mg/l N)	Mean (mg/l N)	SD (mg/l)
Main Spring			
Before 19/3/2017	0.395	0.395	0.0169
After 19/3/2017	0.440	0.440	0.0136
Fish Spring			
Before 19/3/2017	0.360	0.362	0.0246
After 19/3/2017	0.400	0.403	0.0199

The conclusions are that there are seasonal effects with nitrate concentrations but these are smaller than the substantial increases that occurred after mid-March 2017. The reason for this jump in March 2017 is not readily apparent.

The Springs are thought to be mainly fed by two aquifers, a deep Marble aquifer whose water apparently comes from the higher surrounding hills, and a shallow aquifer system whose water comes from the valley bottom (Stewart and Thomas 2008). These aquifers are part of the AMA complex. Their modelling suggested that the Fish Springs have 25% of deep aquifer water and 75% shallow aquifer water, while the reverse was true for the Main Spring. Using the estimates for the proportions of deep and shallow water flow in Stewart and Thomas (2008) and nitrate-N concentrations of the two Springs (Table 1) we have calculated the actual nitrate-N concentrations of the deep and shallow aquifer waters. Further, using the mean flow rates of the two springs (from Thomas and Harvey 2013) we calculated the amount of nitrate-N coming from the two aquifers (Table 2). The results show that the shallow system, which comes from the valley bottom in the AMA recharge area, supplies a third of the nitrate discharged by the Springs.

Table 2: The nitrate-N concentrations in the deep and shallow aquifer parts of the AMA system and the quantity of N coming from these aquifers.

	Pre mid-March 2017		Post mid-March 2017	
	Shallow aquifer	Deep aquifer	Shallow aquifer	Deep aquifer
Nitrate-N (mg/l)	0.345	0.413	0.384	0.461
Nitrate-N (t/year)				
Fish Springs	28.4	11.3	31.5	12.6
Main Springs	25.8	97.9	28.7	109.2
Total	54.2	109.2	60.2	121.8

In summary, this research has shown:

- Nitrate-N in both Springs and in both aquifers are close to or above the trigger level proposed by NIWA (See WCO section B5.2).
- Nitrate concentrations are lower in Fish Springs and in the Shallow aquifer than in the Main Spring and the Deep Aquifer part of this complex system.
- Nitrate-N concentrations, particularly in Fish Spring, show significant seasonal effects. This has not been apparent in the long-term data in the GNS groundwater monitoring programme.
- Nitrate-N concentrations and nitrate discharged from the Springs has increased over the two years of the study but not in a linear or steady manner.
- A third of the nitrate leaving Te Waikoropupū Springs comes via the shallow system while most comes via the deep aquifer system. This conclusion is based on the conceptual model given by Stewart and Thomas (2008).

In addition to the above results, this research is leading to an improved understanding of the dynamics of this complex karst system. However, it has raised the question on the origin of the high nitrate in the Main Spring. The data will also be very helpful in designing an efficient nutrient monitoring system for the Springs. We have begun preliminary work on this latter aspect but have not published this as we wanted at least two full years of results.

Sampling of Eastern Valley Creeks:

The Creeks on the East side of Takaka valley run dry in summer where they cross the marble and their water feeds the deeper part of the AMA (Stewart and Thomas 2008; Thomas and Harvey 2013). We have sampled three of them on three occasions (November 2016, January 2017 and October 2017). We also sampled a small spring close to the bottom of the escarpment on two occasions.

Table 3: Nitrate-N in three creeks and a spring on Eastern side of Takaka Valley during 2016-2017.

	Median Nitrate-N (mg/l)	Range Nitrate-N (mg/l)
Ironstone Creek	0.03	0.03 – 0.04
Gorge Creek	0.09	0.06 – 0.11
Rameka Creek	0.44	0.41 – 0.45
Small Spring	0.23	0.10 – 0.36

4

Ironstone and Gorge creeks primarily drain areas of forest and scrubland and would be expected to have low nitrate-N concentrations (Davis 2014). In contrast, Rameka Creek and to a lesser extent the small spring, are in areas which are a mixture of grassland and forest and scrub. The higher nitrate level in Rameka Creek is of similar level to that found in Te WaiKoropupū Springs.

This initial study suggests that upland pastures are a significant source of nitrate to the AMA but that forested and scrub areas are not.

Recommendations from this research for the WCO:

As stated in the WCO, NIWA has strongly recommended that nitrate concentrations should not be allowed to increase above 0.4 mg/l and it is readily apparent from Figure 1 and Table 1 that in the Main Spring there was a major increase from March 2017 to well above this level. Friends of Golden Bay strongly support NIWA's recommendation that the aquifers be managed to ensure that nitrate does not rise further and preferably should decrease before further farming intensification is allowed.

Currently we are continuing with our water sampling studies in the Springs and AMA. However, we would ask the Tribunal to consider and recommend who should be doing and paying for the more intensive monitoring needed to manage the groundwater.

References:

Davis M. 2014. Nitrogen leaching losses from forests in New Zealand. *New Zealand Journal of Forestry Science* 44 (2); 1-14.

Stewart MK, Thomas JT 2008. A conceptual model of flow to the Waikoropupū Springs, NW Nelson, New Zealand, based on hydrometric and tracer (^{18}O , Cl, ^3H and CFC) evidence. *Hydrology and Earth System Science* 12: 1–19.

Thomas JT, Harvey MM 2013. Water resources of the Takaka water management area. Tasman District Council. 38p.