

**IN THE MATTER**

the Resource Management Act  
1991

**AND**

**IN THE MATTER**

of various resource consent  
applications to irrigate land in the  
Upper Waitaki Catchment

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REBUTTAL EVIDENCE OF GREGORY IAN RYDER  
ON BEHALF OF MACKENZIE WATER RESEARCH LIMITED

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## 1. INTRODUCTION

1.1 My full name is Gregory Ian Ryder. I am a Director of Ryder Consulting Limited. My qualifications and experience were outlined in my evidence in chief. I repeat the confirmation given that I have read, and comply, with the Code of Conduct for Expert Witnesses in the Environment Court.

## 2. RIVER AND STREAM HEALTH

2.1 My evidence in chief provided a peer review of Dr Coffey's work for MWRL and also made comment on matters raised in section 42A reports and submitter reports (on behalf of Meridian Energy and the Department of Conservation) regarding the ecological status McKenzie Basin streams and rivers. I was also asked questions by the panel regarding the existing state of these environments.

2.2 At that time, I had only just received from Environment Canterbury its State of the Environment (SOE) monitoring data (water quality and benthic ecology) for the Waitaki Catchment. I have now had an opportunity to examine the Environment Canterbury data in more detail and to assess this in relation to Dr Coffey's data derived for rivers and streams he monitored in March 2008 and April 2009.

2.3 Dr Meredith from Environment Canterbury was particularly critical of Mr Coffey's analysis of river ecosystem health. He stated at paragraph 58 of his s42A report in relation to Dr Coffey's findings:

*"Other biological metrics (MCI, QMCI, EPT, %EPT) are also presented for nodes and sites. Scores are somewhat more degraded than might be expected in this environment, and this is likely to be associated with the described climatic conditions at the time of sampling. As with the periphyton assessments the sampling conditions can be considered to have occurred at hydrological extremes and so little can be read into them. They generally cannot be considered in any way representative of annual mean condition. Macroinvertebrate communities are dynamic*

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*communities that change over time from regular 'resetting' (flood) events. Optimal sampling is generally at least 3 weeks after a fresh, but generally not after an extended (6 week) recession of stable flows (Harding et al. 2000). It is therefore unfortunate that sampling occurred at sub-optimal and non-representative times."*

- 2.4 Having re-examined Dr Coffey's data in relation to Environment Canterbury's data, in my opinion both datasets indicate an environment with considerable variability in ecosystem health, with many streams exhibiting signs of degradation on a number of occasions. By way of example, I have presented in Figure 1 an index of benthic invertebrate health (QMCI<sup>1</sup>) for streams and rivers in the upper Waitaki catchment monitored by Environment Canterbury and separately by Dr Coffey. QMCI scores are frequently used by regional councils and stream ecologists to help characterise the ecological health of river and stream environments.
- 2.5 Both Environment Canterbury and Dr Coffey's monitoring data indicate to me that, on a number of occasions, streams and rivers within the McKenzie Basin support benthic invertebrate communities that are not indicative of good water quality (QMCI scores are less than 6 – scores greater than 6 are indicative of good water quality) and a number are indicative of moderate degradation on occasions. This supports the findings of Dr Coffey.
- 2.6 Further evidence of locally modified rivers environments can be observed in water quality monitoring data also supplied by Environment Canterbury. Figure 2 provides results of dissolved oxygen and faecal indicator bacteria (*E. coli*) for regularly monitored rivers. The dissolved oxygen concentration of a water body has a strong influence of the biological communities that can be supported, with higher dissolved oxygen concentrations typically supporting communities indicative of good water quality. Faecal bacteria

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<sup>1</sup> The QMCI index allocates invertebrate taxa a score between 1 and 10 depending on each taxon's tolerance to organic enrichment. These scores are multiplied by the abundance of the taxa and divided by the total abundance then combined to give an overall QMCI value. Stark (1998) provided an interpretation of QMCI values as follows: >6 - clean water, 5-6 - doubtful quality of possible mild degradation, 5-4 - probable moderate degradation and <4 - probable severe degradation.

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concentrations provide an indication of the level of human and (more likely in the McKenzie Basin) livestock activity in the catchment, although other animals (birds, possums, etc) can also contribute to faecal bacteria in waterways. The data in Figure 2 indicate depressed DO levels (i.e., less than 80% saturation) and elevated indicator bacteria concentrations in most monitored rivers on some occasions<sup>2</sup>.

### 3. DIDYMO

3.1 Meridian Energy has expressed concern about the potential spread of Didymo (*Didymosphenia geminata*) throughout rivers and lakes of the McKenzie Basin. Dr Snelder and Ms Sutherland provided information on the current distribution of Didymo in the McKenzie Basin. A recent New Zealand study<sup>3</sup> on Didymo concluded:

*“Although ecosystem effects of D. geminata on existing periphyton biomass and invertebrate communities are measurable, no inferences can be made from the present data about effects on higher trophic levels (fish)”.*

3.2 I also note an earlier study found no effects of Didymo on trout growth<sup>4</sup>. That report concluded:

*“Therefore, we cannot conclude that the low invertebrate drift densities and resulting predictions of poor trout growth potential are caused by didymo proliferation. Rather, in our study high levels of didymo biomass were associated with highest trout growth potential.”*

And

*“A review of information on the impacts of didymo on trout indicates that there is currently no scientific evidence available demonstrating negative*

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<sup>2</sup> I should caution that the Environment Canterbury water quality data was supplied to me with the note that provisional information has not yet been checked using the Council's Quality Assurance audit procedures. Provisional information may be subject to changes and are not citeable until reviewed and approved by Environment Canterbury.

<sup>3</sup> Kilroy, K. *et al.* 2009. *Freshwater Biology* 54:1990-2002. doi: 10.1111/j.1365-2427.2009.02247.x .

<sup>4</sup> Shearer, K.A., Hay, J., Hayes, J.W. 2007. *Invertebrate Drift and Trout Growth Potential in Didymo (Didymosphenia geminata) Affected Reaches of the Mararoa and Oreti Rivers: April & August 2006*. Prepared for MAF Biosecurity New Zealand. Cawthron Report No. 1214. 73 p.

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*effects on trout population parameters (abundance and growth).*

*Moreover, there is no scientific evidence available from anglers on the effects of didymo on trout catch rates and size. The negative impacts on trout and salmon fishing, indicated from anecdotal reports from anglers, are aesthetic, fouling of fishing lures, and the inconvenience of having to clean fishing gear and boots."*

3.3 These studies imply that the effects of Didymo in the McKenzie Basin waterways are likely to be more related with aesthetic/recreational impact and hydro/irrigation intake operations rather than aquatic ecology, although I acknowledge that further monitoring over time will ultimately provide a more definitive conclusion on this matter.

3.4 I note that in the introductory S42A report of Ms Penman (paragraph 125) she states:

*"Rivers leading from the lakes are highly modified due to hydroelectricity development, with release flows to Pukaki River and Tekapo River controlled by Meridian Energy Limited, and the majority of lake inflows directed to hydroelectricity canals supplying the Upper Waitaki power scheme. The canals support salmonid populations."*

3.5 Given that the majority of waterbodies in which Didymo is found in the McKenzie Basin (Tekapo River, Lower Ohau River, Tekapo and Ohau B - C Canals) are highly modified environments with managed flow regimes, it seems to me that Meridian Energy are best placed to manage Didymo biomass through their ability to manage water levels and flushing flows.

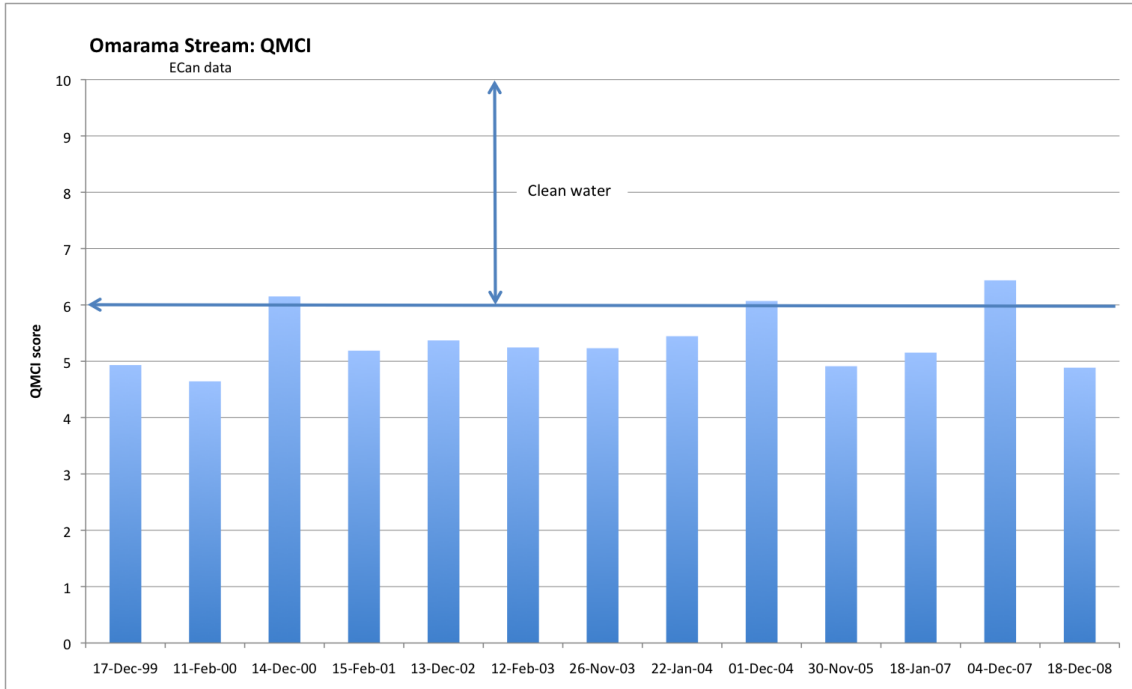
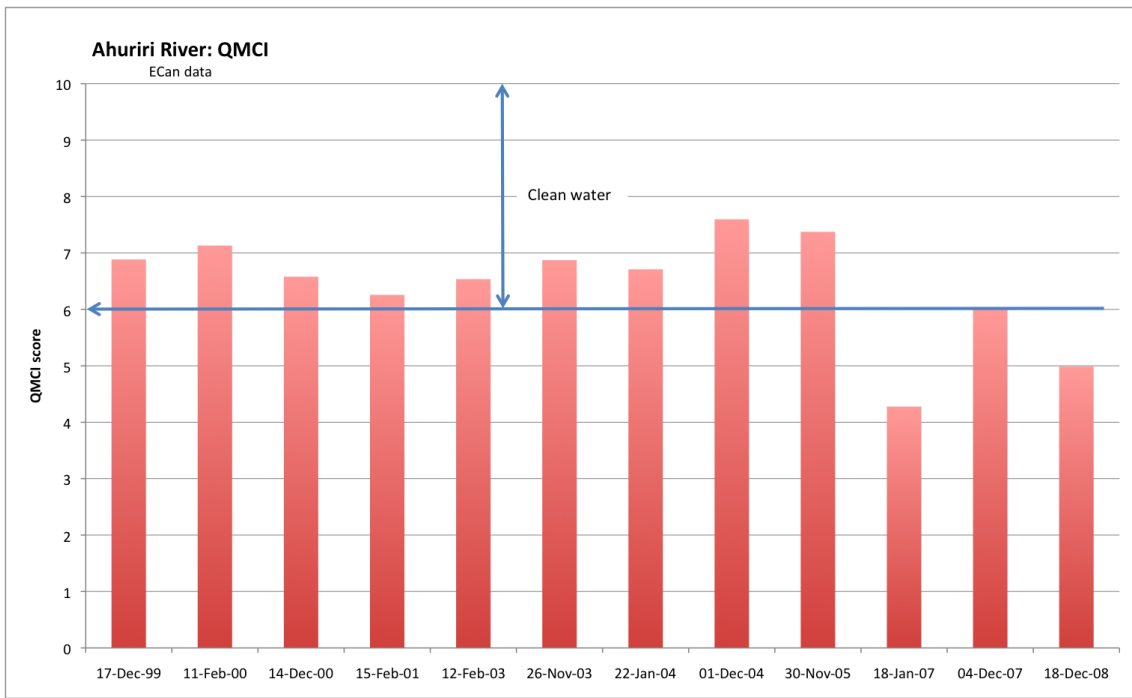
#### **4. CONCLUSION**

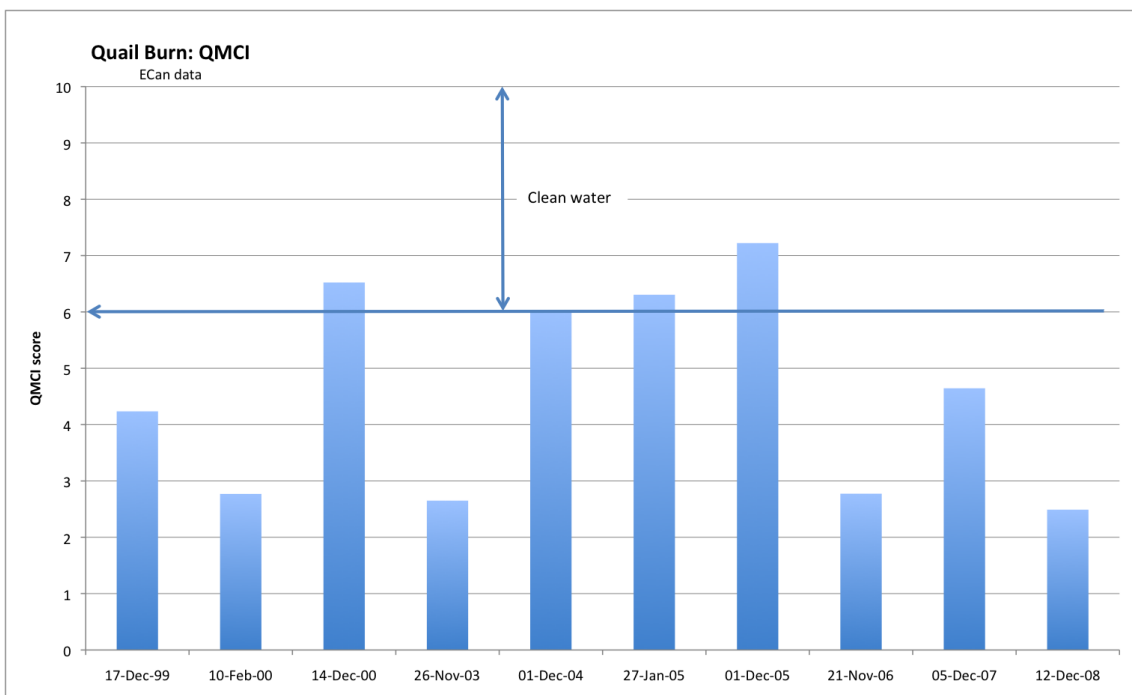
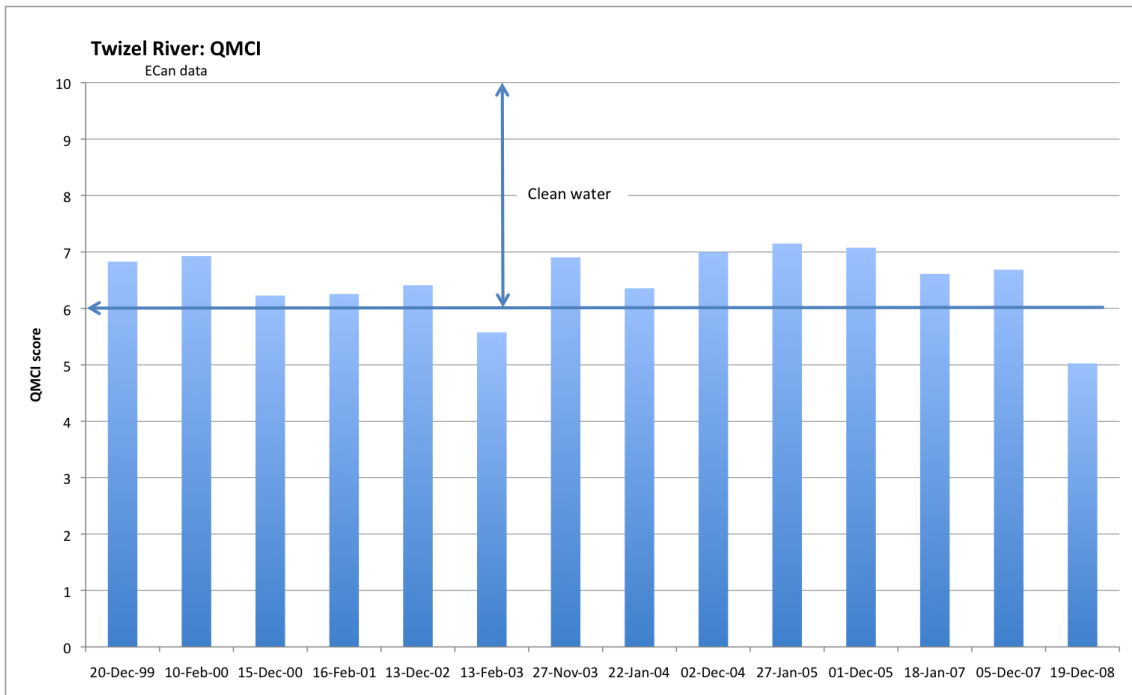
4.1 I reiterate my views that the majority of watercourses within the McKenzie Basin have modified physical, water quality and biological environments. These are due mainly to agricultural and hydro-electricity developments on a wide scale, although Didymo invasion has probably come about through aquatic recreational activities. There is scope for existing effects to be managed through improved on-farm practices and manipulation of water

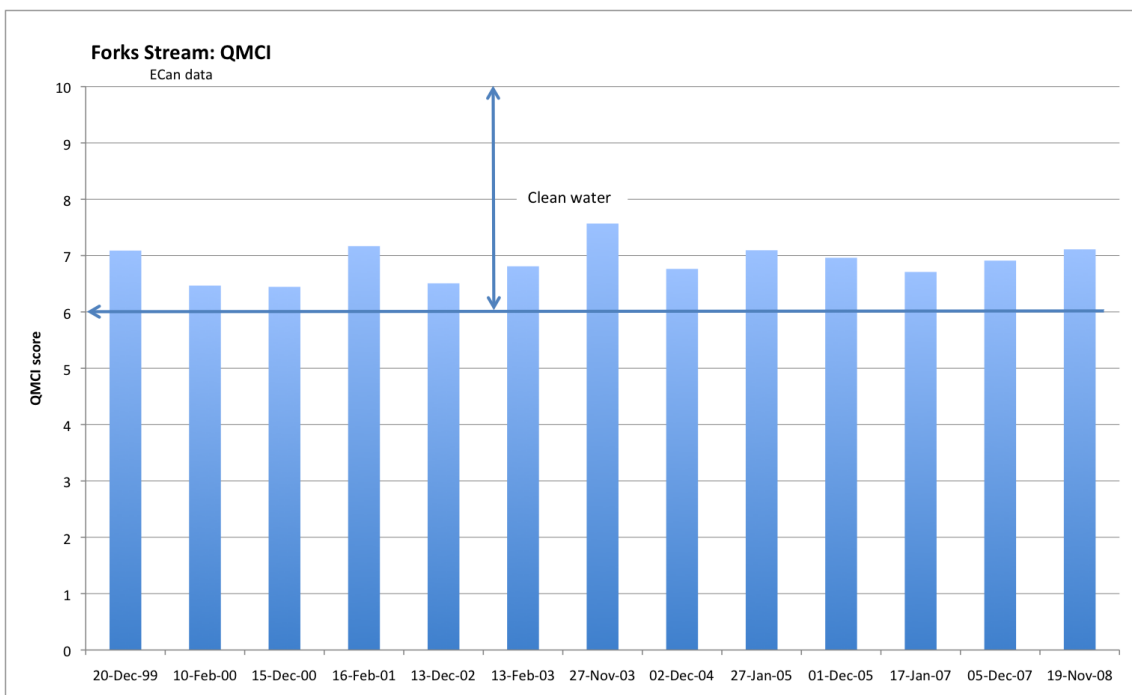
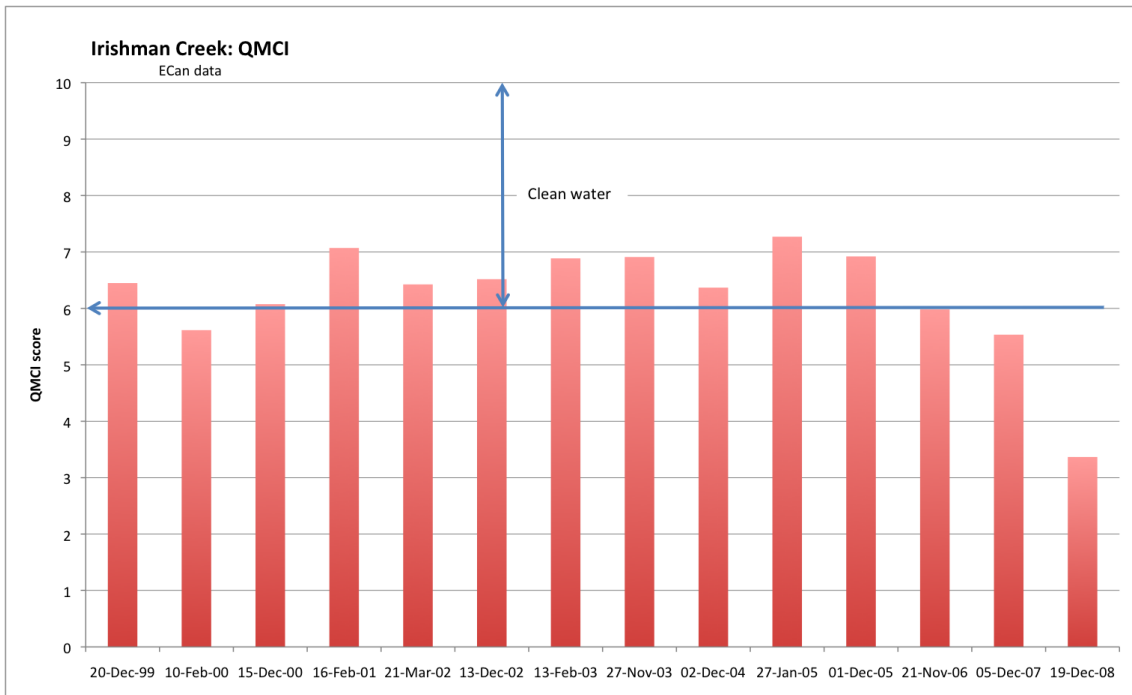
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levels and flows in those waterbodies controlled for hydro generation.

Figure 1. QMCI data for Environment Canterbury monitoring sites in the McKenzie Basin (date courtesy of Environment Canterbury).







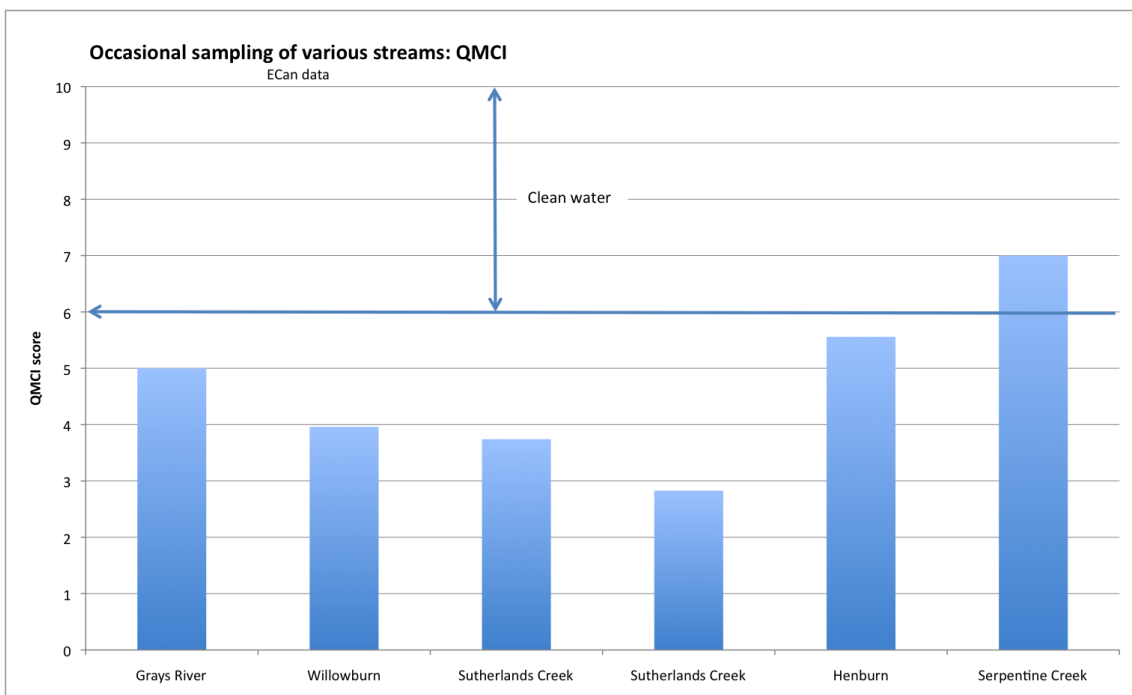
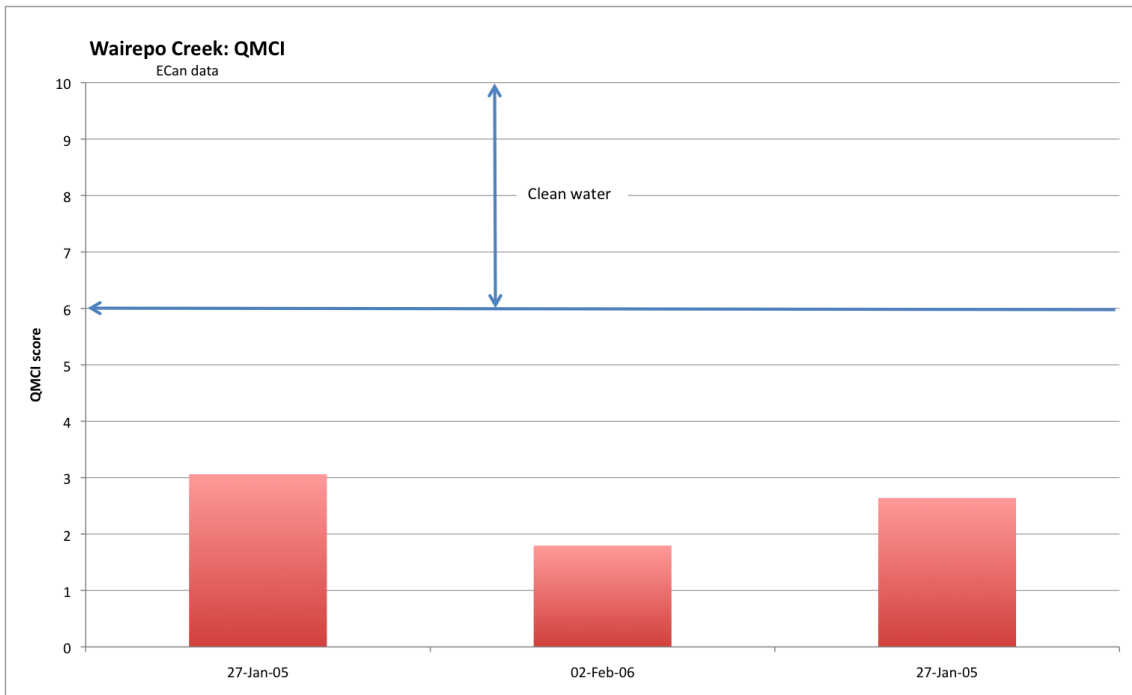


Figure 2. Water quality data for Environment Canterbury monitoring sites in the McKenzie Basin (date courtesy of Environment Canterbury).

