BEFORE A HEARINGS PANEL OF THE GREATER WELLINGTON REGIONAL COUNCIL AND MASTERTON DISTRICT COUNCIL

IN THE MATTER	of resource consent applications to Greater Wellington Regional Council pursuant to section 88 of the Resource Management Act 1991
AND	
IN THE MATTER	of a Notice of Requirement to Masterton District Council pursuant to section 168, 168A and 181 of the Resource Management Act 1991
BY	Masterton District Council
FOR	the proposed upgrade of the Masterton Wastewater Treatment Plant

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STATEMENT OF EVIDENCE OF GREGORY IAN RYDER ON BEHALF OF MASTERTON DISTRICT COUNCIL

Subject Area: Peer review of river ecological aspects

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1. INTRODUCTION

1.1 My full name is Gregory Ian Ryder. I am a water quality scientist and aquatic ecologist and hold BSc. (1st Class Honours) (1984) and PhD. (1989) degrees in Zoology from the University of Otago.

1.2 I am a member of the following professional societies:

(a) New Zealand Freshwater Sciences Society;

(b) New Zealand Water and Wastes Association; and

(c) Royal Society of New Zealand.

1.3 I am a Director of Ryder Consulting Limited, an environmental consulting business with offices in Dunedin, Christchurch and Tauranga. Prior to this I held positions at Otago Regional Council and University of Otago.

1.4 For approximately 24 years, I have been associated with a wide variety of studies on freshwater ecology and water quality throughout New Zealand. I have been project manager for major studies on New Zealand river ecosystems. Regional councils and government departments have engaged me to peer review environmental studies and resource consent applications, and I have held the position of an independent commissioner on a number of major resource consent hearings associated with marine farming, hydro generation, water abstraction and wastewater discharge applications.

1.5 I designed, and for a number of years ran, Environment Southland's State of Environment freshwater monitoring programme and our company currently undertakes Otago Regional Council's annual State of the Environment biological sampling programme for rivers. I assisted both Environment Southland and Otago Regional Council in developing their respective regional water plans.

1.6 In 1993 I was appointed as a technical editor by the Ministry of the Environment in the preparation of its 1994 publication, "Water Quality Guidelines No. 2: Guidelines for the Management of Water Colour and Clarity".

1.7 I have been associated with a large number of ecological and water quality assessments, including consent monitoring, of small, medium and large industrial and municipal wastewater discharges to river and coastal environments throughout New Zealand. Many of these include sewage discharges from towns with secondary

treatment systems not dissimilar to that of Masterton's existing wastewater treatment plant.

1.8 I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note. I agree to comply with the Code of Conduct. Except where I state that I am relying upon the specified evidence of another person, my evidence in this statement is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions which I express.

1.9 I have been engaged by Masterton District Council to provide an independent peer review of the evidence of Dr Chris Hickey and Dr James Cooke.

1.10 I have also been asked to provide my own opinions on the predicted effects of the discharge on downstream water quality following the proposed upgrade of the Masterton Wastewater Treatment Plant. In particular, I have been asked to comment on the quality of the discharge in terms of phosphorus and nitrogen loads to the Ruamahanga River, and the subsequent effects on river ecology.

1.11 My evidence is structured as follows:

(a) scope of evidence;
(b) nutrient loads;
(c) river ecology;
(d) effects of the discharge on downstream water quality; and
(e) conclusion.

2. SCOPE OF EVIDENCE

2.1 My evidence will review the key conclusions that have been reached by Mr Hickey in his analysis, so far as they relate to river ecology. In carrying out this review, I have read the evidence of Drs Hickey and Cooke, and have also read the AEE that accompanied the resource consent application and the relevant technical reports which were used to form the basis of the relevant AEE sections relating to water quality and ecology.

2.2 I have also viewed some of the submissions where there has been reference to water quality and aquatic ecology issues.

3. NUTRIENT LOADS

3.1 Dr Hickey and others have already described in detail the proposed upgrade of the existing wastewater treatment and disposal system. Reductions in pond leakage to groundwater and the discharge of effluent to the land whenever possible, in particular dicharge in summer only when the river flow is above median (12.3 m^3/sec), will result in a reduction in the annual loads of nitrogen and phosphorus to the lower Ruamahanga River and Lake Onoke. The reduction in phosphorus load in particular is significant as this is the nutrient that probably limits the growth of algae in downstream aquatic environments (nitrogen being in abundance due mainly to losses from agricultural land). So if phosphorus inputs can be reduced there is less opportunity for algae to develop to nuisance levels.

3.2 Targeting phosphorus in terms of managing nuisance algal growths is in my experience the correct approach and one that is frequently adopted when managing the effects of point and non-point source discharges to New Zealand freshwater environments.

3.3 In recent years there has been a move to incorporate the natural (and sometimes man-made) variability of river environments into the management of effects induced by the likes of effluent and hydro-electric discharge regimes. In particular it is recognised that flow plays an important role in the accrual of nuisance algae growths on river beds, and high flows (e.g. natural floods or flow releases from storage dams) relative to the preceeding flow conditions can be effective in flushing or scouring algae from the bed. Many resource consent processes I have been associated with, either as an expert witness or as a commissioner, have considered this relationship when drafting resource consent conditions.

3.4 So while moves to reduce the input of nutrients to river environments through improved effluent treatment is appropriate in many instances, there is no reason why the degree and form of treatment should not be considered in light of the dynamics of the receiving water environment, and this has been the approach adopted by Dr Hickey for phosphorus management in particular.

3.5 I consider that the rational behind the adoption by Dr Hickey of a site-specific bioavailable (dissolved) phosphorus concentration guideline of 0.030 g/m^3 for the receiving water after reasonable mixing is appropriate and meets the necessary requirements relating to managing environmental effects. While in statistical terms

there remains a risk of nuisance algal growths developing in a the river immediately below the discharge, I am able to conclude that this risk is low and acceptable, given the relatively low likelihood of such circumstances occurring (due to a combination of timing of the discharge to the river, rapid dispersion and dilution of the discharge, and the frequency of flood events), its localised distribution and the nature of the potential effects on the wider ecology of the river. Comfort can also be gained from the fact the existing discharge appears to result in relatively few, localised nuisance algal bloom events.

4. RIVER ECOLOGY

4.1 I have viewed the information on the existing ecology of the Ruamahanga River. In terms of fish and benthic macroinvertebrates, which are typically the aquatic fauna of most interest in New Zealand rivers, there appears to be no unusal species assemblages and the composition of the fauna is not unique in any.

4.2 The apparent reduction in fish diversity in the lower catchment relative to upstream is something I find contrary to most other river catchments in New Zealand, however it is difficult to see how this could be related to the Masterton WWTP discharge in any way. The majority of municipal discharges to New Zealand rivers are located in the lower reaches of catchments, yet fish diversity remains high relative to upstream. Ammonia is the primary toxicant of concern in municipal sewage discharges with a low industrial component and I note that the ammonia levels in the Ruamahanga River immediately of the existing Masterton WWTP discharge are low relative to guidelines. As I discuss in the next section, it is my experience that fish are relatively unaffected by such discharges. I agree with Dr Hickey that low flows (which influence the availability of instream habitat) and high temperatures (which influence trout distribution in paerticular) are likely to be more important in determining the distribution and abundance of fish.

5. EFFECTS OF THE PROPOSED DISCHARGES ON AQUATIC ECOSYSTEMS IMMEDIATELY DOWNSTREAM OF THE DISCHARGE

5.1 The existing receiving water environment immediately downstream of the discharge is typical of what I have observed in many shallow streams and rivers with stony bottoms subject to municipal treated sewage discharges. That is, there is usually a change in the type of benthic macroinvertebrates between the outfall and 100-200 metres downstream, often with a decline in some of the more sensitive taxa (such as mayflies)

and an increase in less sensitive taxa such as small fly larvae, snails and worms. This is indicative of an increase in enrichment associated with the discharge, and can equally be observed in other environments that are naturally enriched, such as soft-bottomed streams within flood plain environments. However, such changes are confined in their extent and 'recovery' back to upstream conditions is rapid.

5.2 This 'zone' of change is often characterised by an increase in filamentous algae, which is generally regarded as being a nuisance when it begins to dominate the river bed. Dr Hickey has already described such changes in relation to the existing Masterton discharge to the Ruamahanga River, and while monitoring indicates that some effects on instream ecology are apparent, they are not in my experience overly significant and certainly not fatal to the wellbeing of the downstream river ecosystem.

5.3 Increases in filamentous algae can adversely affect the aesthetic values of the river if present in publicly assessable reaches, and can result in a change to the benthic invertebrate community (which represent an important food resource for fish), however unless these nuisance growths occur over a large portion of the river bed and exist for some distance downstream, it is my experience that river communities are not adversely affected to any significant degree. For example, I frequently find adult trout, eels and bullies immediately downstream of effluent from municipal sewage outfalls. Only last week I undertook a regular algae survey in relation to Gore's municipal treated sewage discharge to the Mataura River, a monitoring programme I have been associated with for many years. The Mataura River is arguably the best brown trout river fishery in New Zealand and has an international reputation with anglers. Its lower reaches are subject to multiple discharges from towns and primary industries. I frequently observe adult brown trout actively feeding immediately downstream of Gore's bank-side WWTP discharge (from oxidation ponds), as I did on this occasion, and also from oxidation pond discharges from the townships of Mataura and Wyndham.

5.4 While I do not wish to make light of the potential effects of treated municipal sewage discharges on river ecology, which can contribute to cumulative effects on downstream receiving environments, I consider it is equally important that we should not over-emphasis the effects on river biota. My assessment of monitoring data associated with the existing Masterton WWTP discharge (as reported in Dr Hickey's evidence and the AEE) is that it has not resulted in significant adverse effects to the river ecosystem immediately downstream of the point of discharge, and this finding is consistent with many other similar discharges to rivers that I am familiar with. Such observations are

not unexpected when issues associated with toxic contaminants, particularly ammonia, have been dealt with either by way of treatment or rapid dilution.

5.5 The proposed future discharge regime will be beneficial to instream ecologies. In particular there will be no discharge of nutrients during periods of low flow and an overall reduction in nutrient loads. Accordingly I concur with Dr Hickey that the ecological effects of the proposed discharge in the area downstream of discharge point will be minor.

6. EFFECTS OF THE PROPOSED DISCHARGES ON DOWNSTREM AQUATIC ECOSYSTEMS

6.1 I have also considered potential ecological effects further downstream (i.e., the river downstream of Wardells Bridge including Lake Onoke). The emphasis here is more on the total loading of nutrients entering the Lake Onoke environment. Lakes situated at the bottom end of catchments are particularly vulnerable to eutrophication as they have a tendency to act as sinks for any contaminants that are transported down the river from the wider catchment.

6.2 Dr Cooke and Dr Hickey have addressed the issue of downstream nutrient loads in their respective evidence. Dr Cooke notes that the Masterton WWTP has contributed between 3-8% of the total phosphorus load to the lower Ruamahanga River (at Pukio) and 2-3% of the total nitrogen load, which I agree with Dr Cooke is a relatively minor contribution to the load of nutrients entering Lake Onoke. Dr Cooke has also noted the upgrade would result in the contribution from the Masterton WWTP to the phosphorus load to Lake Onoke under summer baseflow conditions dropping from 43% to less than 2.5%. I consider Dr Cooke's approach to estimates of catchment-wide contaminant loading to be appropriate and similar to those I have undertaken for Environment Southland and Otago Regional Council for determining the relative contribution of point and non-point source contaminant discharges within major river catchments in Southland and Otago.

6.3 Dr Hickey notes that the travel time of the river flow between Wardells Bridge and the sea is rapid above median flows and consequently there is insufficient time for river algal growths to develop. Further, he notes that the water volume of Lake Onoke is rapidly flushed during river freshes, which will also prevent algal blooms occurring. Dr Hickey concludes the elimination of nutrient discharges for summer flows less than median will improve water quality in Lake Onoke during the key summer period and I

agree that this is a distinct possibility provided potential sources of nutrients in other parts of the catchment do not increase.

6.4 Other contaminants associated with the proposed discharge regime are in my opinion unlikely to have any measurable effect on the downstream ecology of the Ruamhanga River or Lake Onoke and I agree with the emphasis placed on nutrients by Dr Cooke and Dr Hickey.

7. CONCLUSION

7.1 The analytical techniques and approach developed by Dr Cooke and Dr Hickey for assessing existing and future effects of the Masterton WWTP are in my opinion sound and relatively conservative. Accounting for the natural flow variability of the river when considering the timing of the discharge and its effect on downstream ecology is appropriate and a practical solution to dealing with nutrient discharges to river environments.

7.2 I conclude from the information I have viewed, that the proposed changes to the discharge regime represent a significant improvement over the existing situation, which appears to result in relatively minor impacts to the downstream ecology of the Ruamahanga River. The biggest improvement to ecology associated with the proposed upgrade is likely to be associated with the removal of the direct discharge to Makoura Stream, resulting in a more healthy benthic invertebrate community and a possible improvement in fish habitat.

Greg Ryder
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