IN THE MATTER OF	the Resource Management Act 1991
AND	
IN THE MATTER OF	resource consent applications by various parties to take and use water from rivers, streams, canals and lakes in the Upper Waitaki Catchment.

SUPPLEMENTARY JOINT STATEMENT OF EVIDENCE OF JOHN CHARLES BRIGHT AND MELISSA CLARE ROBSON

1.1 This supplementary statement of evidence is prepared in response to questions raised by the Hearing Panel. This statement has been prepared by John Charles Bright and Melissa Clare Robson. Dr Bright and Dr Robson's relevant experience is set out in their primary statement of evidence.

1.2 Dr Bright and Dr Robson confirm that they have read the Environment Court's Practice Note dated 31 March 2005. They confirm they have complied with it when preparing my written evidence and agree to comply with it when giving this oral evidence. This evidence is within their respective areas of expertise.

2. QUESTIONS TO BE ADDRESSED

2.1 The following questions from the Hearing Panel are addressed in this statement:

(a) Scale of effects if thresholds exceeded

(b) Consultations with overseas experts regarding lake water quality standards

(c) Lag time lag time from paddock to surface waters

(d) Water quality monitoring network

(e) The reliability of the river data

3. SCALE OF EFFECTS

3.1 The scale of effects at each node point, and of the significance of exceeding the constraining threshold, are summarised in Table 1.

Table 1

Surface Water Sub-catchment	Groundwater sub-catchment	Lake sub-catchment	Groundwater N / P Mitigation in kg/ha per year	Periphyton N / P Mitigation in kg/ha per year	ANZECC N / P Mitigation in kg/ha per year	Lake N / P Mitigation in kg/ha per year	On- Farm N / P Mitigation in kg/ha per year	Scale of environmental effect of 5 % exceedence for constraining receiving environment	Scale of environmental effect of 25 % exceedence for constraining receiving environment	Scale of environmental effect of 50 % exceedence for constraining receiving environment
Ahuriri	Ahuriri	Ahuriri	0 / 0	0 / -0.9	0 / 0	-10.7 / -1.1	-10.7 / -1.1	minor	significant	significant
Omarama	Omarama	Ahuriri	0 / 0	0 / 0	0 / -0.1	-10.7 / -1.1	-10.7 / -1.1	minor	significant	significant
Hen Burn	Hen Burn	Ahuriri	0 / 0		0 / 0	-10.7 / -1.1	-10.7 / -1.1	minor	significant	significant
Quail Burn	Quail Burn	Ahuriri	0 / 0	0 / -0.4	0 / -0.5	-10.7 / -1.1	-10.7 / -1.1	minor	significant	significant
Willow Burn	Willow Burn	Ahuriri	0 / 0		-0.7 / -0.1	-10.7 / -1.1	-10.7 / -1.1	minor	significant	significant
Wairepo Creek	Ohau	Northern	-17.4 / 0			0 / 0	-17.4 / 0	minor	minor	minor
Wairepo Creek	Wairepo	Wairepo Arm / Northern	-16.4 / -0.7		-1.9 / -1.0	-16.4 / -0.7	-16.4 / -0.7	minor	minor	significant
Pukaki/Twizel	Pukaki	Northern	-3.1 / 0		0 / 0	0 / 0	-3.1 / 0	minor	minor	minor
#	Pukaki	Northern	-3.1 / 0		0 / 0	0 / 0	-3.1 / 0	minor	minor	minor
Upper Catchments		Northern					per farm	minor	possibly significant	possibly significant
May Burn	Tekapo	Northern	0 / 0	0 / -0.6	0 / 0	0 / 0	0 / -0.6	minor	minor	significant
Greys River	Tekapo	Northern	0 / 0	0 / -0.1	0 / 0	0 / 0	0 / -0.1	minor	minor	significant
Stony	Tekapo	Northern	0 / 0		0 / -0.1	0 / 0	0 / -0.1	minor	minor	possibly significant

Red: the constraining threshold. Green: a buffer exists between the threshold and the concentration achieved as a result of meeting the constraining threshold.

CONSULTATION WITH LAKE EXPERTS

3.2 The overseas experts consulted were Dr Jose Ramirez and Dr David Horne (GHD Melbourne).

3.3 There were three conversations with these experts:

(a) Around an open questions about acceptable lake quality after explaining the situation.

(b) To discuss the attributes of an Oligotrophic lake.

(c) To test the experts' tolerance of other trophic levels being used.

4. LAG TIME FROM PADDOCK TO NODE POINTS

4.1 The time lag between when a nutrient is leached from a paddock and when it is detectable at a node point is potentially significant for two main reasons:

(a) It represents a period of time when there is opportunity for nutrient transformation or adsorption to reduce the mass of nutrient that is available for transport by water.

(b) It represents a period of time when exceedence of a nutrient discharge allowance may continue undetected for sufficient time to result in significant adverse effects at a downstream node point.

4.2 With respect to the first point, the most conservative, risk averse, stance to take is to assume that there is no nutrient removal processes at work between the bottom of the root zone and the receiving water bodies.

4.3 The GHD analysis assumes that no nutrient removal occurs along the nutrient transport flowpath, except in a relatively small amount of riparian margin where conditions for denitrification to occur are likely to be met.

4.4 The total amount of N removal by denitrification is estimated by GHD to be approximately 7% of the total N load.

4.5 This indicates how close the GHD work is to the wholly conservative assumption of no nutrient attenuation.

4.6 Under these circumstances, travel time (time lag) ceases to be an issue from an attenuation point of view – 93% of all the nitrogen leached from the rootzone is modelled to flow into Lake Benmore. It will take time for the groundwater discharges, specifically, to build up to a new equilibrium level. The GHD results are presented in terms of the new equilibrium.

4.7 Even if no denitrification were to occur, the extra 7% of nitrogen load is still comfortably less than the 20% buffer built into the GHD thresholds for TLI in Lake Benmore.

4.8 In our view the relevance of the time lag is limited to the second matter listed in 5.1 above – how soon will the effects in water ways become measureable.

4.9 The WQS approach is to monitor nutrient leached from the farms immediately below the rootzone. It is practical and robust to do this using a combination of strategically placed lysimeters in combination with the use of OVERSEER.

4.10 Monitoring at this point provides feedback on the effects of the activity at the end of the first year of operation.

4.11 In practice this is feedback without any time lag.

4.12 It identifies any need for corrective action at the earliest possible time. In particular early enough to prevent the build up of a slug of nutrient in the groundwater system that may put the downstream environment at risk.

4.13 A second type of time lag that materially assists with water quality risk management in this case is the development time lag. The conversion from non-irrigated farms to fully developed irrigated farms will take several years.

4.14 This provides opportunity to measure actual nutrient losses under the first developed areas, using lysimeters, and to use this data to fine tune OVERSEER – particularly in regard to its performance with light soils and thus address the main uncertainty identified in evidence by Dr Monaghan.

5. WATER QUALITY MONITORING NETWORK

5.1 The issue has been raised as to whether sufficient groundwater quality monitoring bores have been proposed.

5.2 Thirty nine monitoring bores are proposed and their location is shown on Figure 6 of our evidence in chief.

5.3 Thirty nine bores monitoring the effects of irrigation on about 36,000 hectares represents more than 1 bore per 1,000 hectares irrigated. In our opinion this density of monitoring bores is very appropriate for monitoring the cumulative effects of land use on groundwater quality. It would at least match the monitoring density, at this spatial scale, of other areas on Canterbury.

6. DATA RELIABILITY

6.1 The reliability of the river data has been raised as an issue. We maintain that the quality of the data is such that the WQS is fit for purpose – namely to provide guidance in terms of setting appropriate NDAs for farmers. By way of illustration, it is our opinion that the quality of the river data is not an issue in any sub-catchments other than the Tekapo, Mary Burn and Grays River sub-catchments because the constraining thresholds in all other catchments is either lake water quality or groundwater quality. No criticism has been raised in relation to the quality of the lake data.

6.2 In relation to Tekapo, Mary Burn and Grays River, concern has been raised about the data associated with these sub-catchments and we accept that the data is limited. We propose to address this in caucusing to assess the significance of this. With the rigorous FEMPs and the adaptive management proposed we do not anticipate any effect of significance.

6.3 We understand that information confirming the reliability of the river data is to be presented by GHD at a later date.

John Charles Bright

Melissa Clare Robson

24 Sep. 09