BEFORE INDEPENDENT HEARING COMMISSIONERS

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the hearing of submissions on Proposed Variation 1 (Selwyn-Waihora) to the Proposed Canterbury Land and Water Regional Plan

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STATEMENT OF EVIDENCE OF ANDREW ROBERT CURTIS ON BEHALF OF IRRIGATION NEW ZEALAND INCORPORATED

Dated: 8th September 2014

INTRODUCTION

1. My name is Andrew Curtis.

2. I have provided a summary of my qualifications and expertise in my primary evidence.

SCOPE OF EVIDENCE

3. My evidence provides additional technically-based observations to rebut some of the conclusions reached by -

   a. Mr Bennett in his evidence for Federated Farmers

   b. Mr Ford in his evidence for Horticulture NZ

   c. Ms Dewes in her evidence for Fish & Game.

4. My evidence will cover the following matters:

   Mr Bennett

   a. New mechanism for restricting water transfers (paragraph 104)

   Mr Ford

   b. Priority of use (4.64 - 4.79)

   Ms Dewes

   c. Water Measurement Update (paragraph 128)

   d. Cost of Achieving 'Active Management Irrigation' (paragraph 134)

   e. 'Active Management Irrigation' (paragraph 41 , 129 & 152)

A. New Mechanism for Restricting Water Transfers

5. The evidence of Mr Bennett provides an alternative solution to a blanket surrender of 50% for a transfer outside of CPW shareholders. Such an approach is not required for the Selwyn-Waihora zone as it would add complexity to the plan with little benefit. In my evidence it is clear there have been a limited number of transfers in

the zone, however there are also some benefits to be gained from allowing these to continue. Therefore the contribution a new 'transfer water surrender mechanism' would make towards the resolution of over allocation is limited.

B. Priority of Use

6. Whilst I agree with the evidence of Mr Ford that the consequences of low reliability for a number of horticultural crops, particularly permanent horticulture, can be significant, I believe it is important that no plan based priority of right be established between irrigated land uses.

7. Whilst the financial impacts from low reliability upon pastoral land uses could generally be regarded as less severe (this is dependent upon the horticultural crop type and when the low reliability occurs) in reality the actual impacts are case (enterprise) specific and relate to the level of farm investment and subsequent debt. It would therefore be inequitable to create a higher reliability class for horticultural enterprises based upon this.

8. The provision of a water transfer mechanism, or the ability to build on-farm or access regional storage provides horticulturists seeking greater than 9 in 10 year reliability the opportunity to gain this for their enterprises. This is a common approach overseas. Picking irrigated land use winners should be left to market forces and not decided by an inflexible plan based priority that is unable to move with the volatile nature of commodity prices.

9. Another mechanism for better allowing increased reliability for horticultural enterprises is through enabling irrigator user groups. There are a number of examples in NZ and overseas where communities of irrigators have come together and made decisions to prioritise their water supply between them based on specific circumstances or criteria. This is a far better mechanism to adopt as it allows for the spatial and temporal nature of reliability and the different crop types to be better catered for. It also avoids pitting irrigator against irrigator.

10. However I do believe there is one exception to the 'no priority for irrigated land uses' and that is the provision of survival water to ensure that the rootstock of permanent

horticultural land uses remain viable. Permanent horticulture requires a considerable long-term investment with many years of no or low returns (no or low production whilst trees or vines grow). The viability of the rootstock should therefore be ensured through severe drought events.

C. Water Metering Uptake

11. The evidence of Ms Dewes in paragraph 77 is misleading and understates the actual implementation of the water measurement regulations in Canterbury. The numbers given in her evidence are not a true indication of uptake to date. There are 8,390 takes in Canterbury equating to approximately 11,000+ meters. Of this there are 5,547 active takes over 20l/s. In September 2014 there were 4,615 takes with meters (84%) and 932 without meters (16%)[1]. Of those without meters 493 had waivers, 78 gad waivers pending, 64 were not given effect to and 22 were in the process of surrender. This means there were only 275 takes (less than 5%) without meters.

D. Cost of Achieving 'Active Irrigation'

12. Ms Dewes evidence as to the implementation costs of 'Active Irrigation' is simplistic. I refer you to the evidence in paragraph 134. Achieving 'Active Irrigation', from flood to spray for example, is not solely related to upgrading an irrigation system and its associated farm infrastructure. The nature of the water supply to the irrigation (water take and distribution system characteristics) must also be considered. IrrigationNZ has estimated that over $2billion of infrastructure investment (modernisation of the distribution systems and associated water storage) will be required in the Canterbury region to deliver 95%+ water supply reliability.

13. It is difficult to place a price per hectare on the cost of reliability, as the actual costs will be zone and scenario specific. However as a 'typical' example, the Valetta scheme in Mid Canterbury has recently piped its open races. This when combined

[1] *Colin Bird, Environment Canterbury pers comm*

with the new buffer ponds now allow for an 'on-demand' reliable water supply. The total cost was $30million or $6,800ha to the incumbent shareholders. The selling of new water created through efficiency gains (piping) has subsidised the cost to the incumbent.

14. The nexus between limiting land use change and a reliable water supply to allow investment in improved performance is crucial. Incumbents are reliant on selling new water from efficiency gains which in turn requires land use change. Without this the economic viability of creating reliability and thus improved performance and land use diversification is compromised – not affordable.

15. In summary the doubling, a range of $14,000 - 18,000ha of Ms Dewes assumptions of $8,800ha would provide a more realistic cost for universally achieving 'Active Irrigation'.

E. Active Management Irrigation

16. When designed, installed, operated and maintained well, irrigation will optimise plant growth throughout the growing season and also from season to season. Well-managed irrigation replaces the soil water used by plants (the soil moisture deficit) once a predefined trigger has been reached. The trigger and amount applied is defined by soil water holding characteristics, soil temperature, the crops' physiological characteristics (water use and drought tolerance) and climatic conditions (evapotranspiration and rainfall).

17. Ms Dewes notes at paragraph 41 and 129 of her evidence that if "active water management" is selected in OVERSEER, it is assumed that 30-50% reductions in NZ can be made. This statement cannot be proven as the actual size of the reduction is yet to be determined. The assumptions that OVERSEER makes through the selection of its 'Active Management Irrigation' option (5% drainage losses) are not realistic.

18. Table 1 is taken from a New Zealand (NZ) based Lincoln Environmental study[2] and highlights the range of typical losses from irrigation. The NZ data is consistent with

[2] *Lincoln Environmental 2002. Irrigation Efficiency Enhancement - Stage 1. Report No 4452/16a*

international findings. From this it is obvious that a range of factors drive efficiency, and that when each of the factors that drive efficiency (leaks, evaporation, wind drift, canopy interception, surface run-off, system uniformity (evenness of application), excessive application depths and application rates in excess of the soil's infiltration rate) are combined, 95% application efficiency is unrealistic.

Loss component	Range	Typical
Leaking pipes	0-10%	0-1%
Evaporation in the air	0-10%	<3%
Wind blowing water off target (drift)	0-20%	<5%
Interception (canopy losses)	0-10%	<5%
Surface runoff (spray irrigation)	0-10%	<2%
Uneven application and/or excessive application depths and rates	5 - 80%	5 - 30%

Table 1: The Drivers of irrigation Application Efficiency

19. Table 2 is taken from a 2011 University of Nebraska 'know how know now' extension sheet on 'Irrigation efficiency and uniformity, and crop water use efficiency'[3]. This extension sheet has been peer reviewed. The University of Nebraska, Lincoln is one of the world's leading irrigation research facilities and is supported by two of the five main centre pivot manufacturers (T-L and Valley). These typical values for well-designed and well-managed irrigation systems again demonstrate that 95% application efficiency is not realistic.

20. Therefore, even with the introduction of precision technologies, such as Variable Rate Irrigation alongside soil moisture monitoring, it would be extremely unlikely 95% application efficiency would be achieved. It should be noted the industry benchmark, from the IrigationNZ Design Standards[4] is 80% for application uniformity and on a per system basis for application efficiency.

21. The issue of the 'Active Management Irrigation' option within OVERSEER has been discussed with the OVERSEER owners and the primary industry. As a result there is a protocol that clearly states the 'Active Management Irrigation' option within

[3] *University of Nebraska Lincoln, Extension 2011. Irrigation Efficiency and Uniformity, and Crop Water Use Efficiency EC732*
[4] *IrrigationNZ 2012. Design Standards for Piped Irrigation Systems in New Zealand*

OVERSEER should not be used. The evidence of Ms Dewes demonstrating 30 - 50% leaching reductions is therefore unsound.

Table 2. Typical "*typical*" application efficiencies for well-designed and well-managed irrigation systems.

Irrigation System	*"Typical" Application Efficiency (%)*
Sprinkler Irrigation Systems	
LEPA	80 - 90
Linear move	75 - 85
Center pivot	75 - 85
Traveling gun	65 - 75
Side roll	65 - 85
Hand move	65 - 85
Solid set	70 - 85
Surface Irrigation Systems	
Furrow (conventional)	45 - 65
Furrow (surge)	55 - 75
Furrow (with tailwater reuse)	60 - 80
Basin (with or without furrow)	60 - 75
Basin (paddy)	40 - 60
Precision level basin	65 - 80
Microirrigation Systems	
Bubbler (low head)	80 - 90
Microspray	85 - 90
Micro-point source	85 - 90
Micro-line source	85 - 90
Subsurface drip	> 95
Surface drip	85 - 95

22. Ms Dewes also refers to soil moisture monitoring and specifically tensiometers as part of 'Active Management Irrigation'. Soil moisture monitoring is becoming commonplace in Canterbury, particularly for pastoral farmers. It should be noted however that soil moisture monitoring is more suited to semi-permanent or permanent pasture rather than annual cropping because of the practical issues cultivation creates for the sensors or access tubes. It is common knowledge that low cost tensiometers are not well suited to stony soils as they rely on good instrument to soil contact to effectively operate – to create the tension. More expensive TDR or neutron probe technologies need to be adopted in such scenarios.

23. Soil moisture monitoring is not a silver bullet - it is a mitigation that will help provide solutions for specific cases. Other scheduling options include water budgets and crops models. Simple rules of thumb have also been developed by experts at Landcare research. For example the electric fence standard method works well in the

Downlands of South Canterbury where a diversity of soil types and depths makes traditional soil monitoring or water budget methods extremely complex – slope and aspect variations have to be added to soil type variability. The same could also be stated around variable rate irrigation technologies – they work well in heterogeneous scenarios but have little benefit for homogenous ones.

Andrew Curtis

8 September 2014