APPENDIX 1
Extract from Draft Decision

1. Mr Potts assessed the required maximum intake flow of 20.5 cumecs to irrigate a net area of 40,000 ha based on a requirement of 0.53 litres per second per hectare for most of the scheme area, with lower rates in other areas. This included allowance for race seepage and bywash, and also included the 3.06 cumecs sought for the Waihao Downs area.

2. Mr Potts said that given the size of this scheme, crop variability, soil types and management practices, farms within the scheme command area are unlikely to want peak allocation at the same time. He then said that the scheme's design and control systems are to be designed to manage the fluctuation in water demands within the scheme and the infrastructure was generally designed with the capacity to provide water to satisfy a 1 in 10 year dry month.

3. Mr Potts said that the peak design parameters used for the Timaru area were:
   ii. 1:10-year drought event, equivalent to 3.3 mm/day;
   iii. 90% off-farm efficiency (piped and canal). An off-farm efficiency of 90% is a generally accepted appropriate design assumption for this system design, as the water will be lost from the main transfer and distribution canals through leakage, evaporation and management flexibility – ability to provide water on demand to where it is needed, particularly during periods when demand is less than peak.
   iv. 80% on farm efficiency at peak periods for centre pivots with K-line fill in. This efficiency is a combination of distribution efficiency (80 – 90%), evaporative losses, and management efficiency (the decision to irrigate when rainfall may occur). This level of efficiency is considered best practice.

4. He said the calculated requirements are therefore 4.1 mm/d for on-farm demand and 4.6 mm/d for off-farm. On an instantaneous application rate basis, the gross scheme peak demand is 0.53 L/s/ha, or 321 m3/ha/week.

5. Mr Potts estimated that typical irrigation application return periods for the scheme are likely to be in the range of 5 - 14 days. The areas of the scheme which have soils with a lower PAW (Plant Available Water) and centre pivot application systems will generally have the shortest return periods.

Seasonal Demand

6. Mr Potts then described how the Gross Scheme application had been calculated considering the following:

7. On-farm efficiency variability throughout the season as the high efficiency values above cannot be achieved throughout the entire season when not at peak demand. Management decisions during the season add to the annual demand due to deep percolation losses. With travelling irrigators, the soil moisture across a farm during peak periods will generally vary from about 75% to 25% of field capacity depending on whether the paddock has just been irrigated, or is just about to be irrigated.

8. He then said that it will be a requirement of the scheme that on-farm designs are carried out to the Irrigation New Zealand Code of Practice, with all designers vetted to ensure standards of design are met. This will ensure that optimal system design is achieved for each farm layout and soil type. The system flow rate, irrigator speed, application depth and return period will all be based on the peak requirement.

9. Mr Potts then produced Table 1 showing the variability of the scheme demand over the season.

Table 1: Seasonal Demand (Reproduced from Mr Potts evidence in chief p.7 para.23)

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Sep**	**Oct**	**Nov**	**Dec**	**Total**
Timaru Area	d, e	d, e	a, b	a, b	c	a, b	a, b	d, e	d, e	
Mean Effective Deficit (mm/month)	81	51	30	11	-	3	48	67	79	**370**
Gross Scheme Application (mm/month)	113	71	50	18	0	5	81	113	133	**583**

a On-farm irrigation efficiency of 70%. b Off-farm efficiency taken as 85%.

d On-farm efficiency taken as 80% e Off-farm efficiency taken as 90%.

10. From Table 1, the average operating days (number of irrigation days at peak demand) for the Timaru area is 127 days, spread over 8 months, i.e. a total season length of 242 days.

11. Allocation Plan Policies 16 (c)(i) and (ii) requires the annual volumes to be assessed against the 1 in 5 year dry season or ECAN report U05/15, which is the basis for Schedule WQN9 of the proposed NRRP.

12. Mr Potts agreed that Schedule WQN9 was intended to provide sufficient water in eight years of ten (equivalent to 1 in 5 year dry year assessment). However, if that allocation block is then also used with the proposed surface water reliability, the combined reliability may be lower. The WQN9 allocation is applied to on-farm takes, generally from groundwater and is thus considered to be 100% reliable, as most groundwater takes do not have low groundwater trigger level restrictions on them.

13. Mr Potts then said that Rule WQN25 of the proposed NRRP is the permitted activity rule for use of water for irrigation. Condition 1(a) requires that irrigation use is within an annual volume calculated as per Schedule WQN9 (revised via Variation 2), but that Rule WQN26 of the proposed NRRP is the discretionary activity rule for use of water for irrigation if the annual volume is in excess of Schedule WQN9. Discretion is open and includes showing efficiency of conveyance and application, the rate and take is a reasonable requirement, and the effects on down gradient drainage and water bodies.

14. Mr Potts assessed the water use using:
    (i) the method reported in ECAN report U05/15; and
    (ii) the calculation provided above in Table 1.

15. Mr Potts made the point that WQN9, arable use is allocated less water than intensive pastoral. The scheme command area covers a mix of soil types and land uses. The DWG (Duffill Watts Group) water requirement assessments have been based on climatic and soil data only and not crop type. Therefore, to be consistent with the DWG soil and climatic assessment above, the WQN9 values shown are for intensive pastoral use only. Also note that WQN9 is an on-farm assessment only, hence off-farm requirements are not included, i.e. the annual application

depths in WQN9 need to be increased by 10% - 15% to compare with the H D I scheme.

16. Mr Potts believed that for the majority of the command area the WQN9 allocation assessment would therefore be 440 – 570 mm and the DWG average allocation assessment is 583 mm (including off-farm losses). He said that the DWG figure reduces to approximately 510 mm/yr without off-farm losses.

17. The WQN9 allocation does not meet the Scheme's water requirements in extreme seasons because the WQN9 assessment is only sufficient for a 1 in 5 year dry season and assumes an on farm efficiency of 80% for the entire season. In addition, as explained above, even with very efficient irrigation systems, it is not possible for 80% of the applied water, in combination with rainfall, to be effectively used in the shoulder season.

18. The annual water allocation being applied for is in the same range as the WQN9 assessment and thus could be considered a reasonable annual use of the water.

19. There are a number of concerns with the applicants' proposed annual allocation:
    (i) The Duffill Watts Group method does not appear to meet the criteria of policy 16 of the Allocation Plan .
    (ii) There are errors in the last three columns of the fourth row of Table 3. The gross total scheme application should be 541mm rather than the 583mm shown which is equivalent to 17 million cubic metres per year.
    (iii)The justification for applying intensive pastoral land use to the whole of the area for the WQN9 analysis is not appropriate and contrary to the evidence on likely future land use (Agribusiness Group Report- Hunter Downs AEE).
    (iv)Reticulation losses of greater than 10% would appear to exceed what is reasonable and efficient. The allocation for irrigation is limited and excessive reticulation losses restrict other potential irrigators from gaining access to water.
    (v) A WQN9 analysis using appropriate land use categories is likely to result in a significantly lower annual allocation figure.

Conclusion

20. For the above reasons we think the annual volume of 251 million cubic metres may well have been over calculated. Our estimate is that based on WQN9 the annual volume be 190 to 215 million cubic metres (excluding any off farm losses) depending on the percentage of the area that remains arable. Later in this decision we will be referring to the case for another potential irrigator Irrigation North

Otago (INO) and its need for water and the Allocation Plan's policies for efficiency combine to make us question whether it is necessary for HDI scheme to have an allocation of 251 million cubic metres per annum. In our conclusions we will refer to this matter again. It is one of the matters that has necessitated an interim decision.