

ROB POTTS: ADDENDUM TO EVIDENCE

- 1 In this addendum I discuss details of one of the proposed HDI flow sharing regimes. This could be developed to accommodate abstraction by other users.

Hunter Downs Irrigation Lower Waitaki River Water Sharing Regimes

- 2 The favoured water sharing regime is a single flow banding system with all irrigation abstractions sharing the WRP 90 cumec allocation on a pro-rata basis. This is the same as that proposed by the applicants but where Meridian and irrigators differ is how low flow times are dealt with.
- 3 The single band divides the available flow above the minimum flow proportionally based on the size of individual consent's actual requirements.
- 4 While some of the applicants at this hearing do not choose to adopt HDI's ramping condition, I believe it is necessary for these applications to have some method for reducing their abstraction during times of low flow.
- 5 I consider a system of ramping or alternatively an agreed water users group arrangement is needed. This is required regardless of whether a 24 hour average or a 1 hr average is used to determine what water can be taken. The alternative to ramping is a simple on - off system. This has not been requested by HDI but does appear to be the fall back position of MRNAG under Option B.

Condition 8 of HDI

- 6 Below I will explain how the currently proposed ramping condition in HDI (condition 8) is made up. The formula that has been developed at first glance looks complicated but when broken down into components is relatively simple. I will explain each component that I have circled:

$$\text{HDIS}_{\text{Restricted}} = \frac{[\text{Flow}_{\text{KR}} - \{100 + (\text{EC} * \text{F})\}] * (\text{HDIS}_{\text{max}})}{\{\text{AC} - (\text{EC} * \text{F})\}}$$

- 6.1 $\text{HDIS}_{\text{Restricted}}$ is the rate at which water may be taken from the Waitaki River (m^3/s) during times of restriction. This varies

with flow at Kurow and the allocated demand for irrigation water.

$$\text{HDIS}_{\text{Restricted}} = \frac{[\text{Flow}_{\text{KR}} - \{100 + (\text{EC} * \text{F})\}] * (\text{HDIS}_{\text{max}})}{\{\text{AC} - (\text{EC} * \text{F})\}}$$

- 6.2 Flow_{KR} is the calculated flow in the Waitaki River (m^3/s) at Kurow. The flow is calculated to allow for diversions which take water above the Kurow recorder and return it below, i.e. NBTC.

$$\text{HDIS}_{\text{Restricted}} = \frac{[\text{Flow}_{\text{KR}} - \{100 + (\text{EC} * \text{F})\}] * (\text{HDIS}_{\text{max}})}{\{\text{AC} - (\text{EC} * \text{F})\}}$$

- 6.3 This is the flow sort by HDI at which its abstraction must cease ($100 \text{ m}^3/\text{s}$). For other applicants who have sought a varying monthly minimum flow the 100 in the above equation would be replaced with each months minimum flow, thus creating 12 equations.

$$\text{HDIS}_{\text{Restricted}} = \frac{[\text{Flow}_{\text{KR}} - \{100 + (\text{EC} * \text{F})\}] * (\text{HDIS}_{\text{max}})}{\{\text{AC} - (\text{EC} * \text{F})\}}$$

- 6.4 $(\text{EC} * \text{F})$ term is added to the flow at which abstraction must cease. This term could be used to reserve a proportion of water for existing consents (EC) which does not have to be shared with this new applicant. If F is set at 0, there is no water reserved for existing consents; likewise, if F is set at 1, then existing consents are placed in a totally separate band and have all of their water reserved. The factor would be set once and not varied for the duration of the consent. F is set based on how much effect on existing users reliability is determined to be acceptable.

$$\text{HDIS}_{\text{Restricted}} = \frac{[\text{Flow}_{\text{KR}} - \{100 + (\text{EC} * \text{F})\}] * (\text{HDIS}_{\text{max}})}{\{\text{AC} - (\text{EC} * \text{F})\}}$$

- 6.5 This part of the equation is determining how much water is available above the minimum for all new abstractors. It is looking at the river flow and then subtracting the minimum flow and the amount reserved for existing consents (if any). What's left is then available for pro rata allocation to the new consent holder.

$$\text{HDIS}_{\text{Restricted}} = [\text{Flow}_{\text{KR}} - \{100 + (\text{EC} * \text{F})\}] * \frac{(\text{HDIS}_{\text{max}})}{\{\text{AC} - (\text{EC} * \text{F})\}}$$

- 6.6 This part of the equation is calculating the proportion of the peak demand that the new consent holder could be allocated. HDIS_{max} is the consented peak abstraction rate (20.5 m³/s for HDI). AC is All Consents, which will eventually equal 90 m³/s. The term $\text{AC} - (\text{EC} * \text{F})$ is determining the peak demand of consents not already allowed for in the first part of the equation. If F is 0, then this is the peak allocated demand of all consents. This number will vary as new consents are granted.
- 6.7 For this equation to be applied to consents at this hearing for all applicants, the minimum flow needs to be determined and included to replace the 100 and the applicant's peak abstraction rate included to replace HDIS_{max} .

- 7 I have provided three examples below showing how the equation works:

- 7.1 (1). Flow in the Waitaki River at the Kurow recorder is 180 m³/s, existing users total 51.89 m³/s and have equal priority with new applicants, the HDI maximum take is 20.5 m³/s and assuming that the entire 90 m³/s allocation block is fully allocated;

$$\text{HDIS}_{\text{Restricted}} = [180 - \{100 + (51.89 * 0)\}] * \frac{(20.5)}{\{90 - (51.89 * 0)\}}$$

$$\text{HDIS}_{\text{Restricted}} = [180 - \{100\}] * \frac{(20.5)}{\{90\}}$$

$$\text{HDIS}_{\text{Restricted}} = [80] * \frac{(20.5)}{\{90\}}$$

$$\text{HDIS}_{\text{Restricted}} = 18.22 \text{ m}^3/\text{s}$$

7.2 (2). Flow in the Waitaki River at the Kurow recorder is 160 m³/s, existing users total 51.89 m³/s and have full priority over new applicants, the HDI maximum take is 20.5 m³/s and assuming that the entire 90 m³/s allocation block is fully allocated;

$$\text{HDIS}_{\text{Restricted}} = [160 - \{100 + (51.89 * 1)\}] * \frac{(20.5)}{\{90 - (51.89 * 1)\}}$$

$$\text{HDIS}_{\text{Restricted}} = [160 - \{151.89\}] * \frac{(20.5)}{\{38.11\}}$$

$$\text{HDIS}_{\text{Restricted}} = [8.11] * \frac{(20.5)}{\{38.11\}}$$

$$\text{HDIS}_{\text{Restricted}} = 4.36 \text{ m}^3/\text{s}$$

7.3 (3). Flow in the Waitaki River at the Kurow recorder is 180 m³/s, existing users total 51.89 m³/s and have half priority over new applicants, the HDI maximum take is 20.5 m³/s and assuming that the entire 90 m³/s allocation block is fully allocated;

$$\text{HDIS}_{\text{Restricted}} = [180 - \{100 + (51.89 * 0.5)\}] * \frac{(20.5)}{\{90 - (51.89 * 0.5)\}}$$

$$\text{HDIS}_{\text{Restricted}} = [180 - \{125.94\}] * \frac{(20.5)}{\{64.06\}}$$

$$\text{HDIS}_{\text{Restricted}} = [54.06] * \frac{(20.5)}{\{64.06\}}$$

$$\text{HDIS}_{\text{Restricted}} = 17.29 \text{ m}^3/\text{s}$$

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