FACTORS AFFECTING INFLOWS INTO HARVEY WATER IRRIGATION SUPPLY DAMS

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INTRODUCTION

Thank you for inviting me to speak at this forum this afternoon.

Who I represent is Harvey Water and beyond that the irrigator members of our water supply cooperative who are actually the customers for water supply from the catchments and the forests we are talking about this afternoon.

Harvey Water's position is that we are clearly getting lower inflows into all our dams and this is having a negative effect on our members. We do suspect that bauxite mining, notably in the Waroona dam catchment, isn't helping, but this is confounded by the clearly negative influences of climate change that are affecting all of our dams.

But first I think I should provide a little background to Harvey Water for those who may not know much about us.

MAP

Harvey Water is a fully private irrigation water supply cooperative providing water delivery services to our 750 members in the Waroona, Harvey and Collie River Irrigation Districts.

Our water supply comes exclusively from 5 large surface water dams, (Waroona, Drakesbrook, Logue Brook, Harvey and Wellington) with a smaller opportunistic supply from the Wokalup Pipehead dam. Those dams are owned by Water Corporation but operated by Harvey Water by agreement with them.

We have licences to operate as a water supply utility from the ERA and 3 Surface Water Licences from the Department of Water (DoW), one for each district. The sum of those licences is 137 GL.

Our irrigators are largely dairy, beef and horticultural farmers, although the demand from dairy has been smashed by deregulation, artificially low prices and some pretty dodgy business practices recently.

In terms of the relative supply of water you can see that we rely on four dams in the north and one in the south. The catchment sizes relative to water supply are variable.

We piped the Waroona/Harvey district about 10 years ago and now operate them as one district delivering water under gravity pressure to the farm. We are in the process of putting together as proposal to do something similar for the Wellington/CRID.

CATCHMENTS

Graph

This graph shows the area of each catchment & its licensed volume but it doesn't imply that there should be the same relationship between them.

Table

What the table shows probably more clearly is that the Waroona catchment has to work about 10 times harder than the Collie River catchment and about 50% harder than the Harvey catchment. Is that to do mainly with the size of the catchment or the vegetation in each?

But it follows that if there is something affecting the streamflow in the smallest catchment of Waroona, it is going to have the biggest effect.

I will show you later how we compared the Waroona catchment with the Collie River catchment to see if the effects were similar.

So we looked at what was happening in that catchment. Obviously bauxite mining was the big one, and there was a local rumour that the mining company had actually turned back the river to fill one of their dams up in the hills. So we got our engineers to go up and sniff around and they found no evidence of that.

This is why we call our periodic information sheet the Furphy because we have learned that our members much prefer a juicy, totally outrageous rumour to the facts.

Bauxite mining.

Mining started in the jarrah forest about 1965 and this Google earth photo shows how the extent of it has grown at Waroona.

The Waroona catchment spreads out in a roughly round shape to the east and more to the north of the dam.

With the Waroona/Drakesbrook catchment being only 50 square kilometres you could expect that clearing of the extent shown would have a measurable effect on inflows. First you might expect that run-off/stream flow would increase and then later decrease as the intense type of rehab being used took effect and that it would then decrease.

Harvey Water is not making ourselves out to be experts here, but what our old hands tell us is that the bauxite layer in the ground is relatively shallow and impermeable and so run-off

from the full groundwater above the bauxite was both quicker to begin and lasted longer than now.

With the rehab, the ground below the previous bauxite layer is deep ripped on the contour followed by mounding and then planting, both on the contour as well. With the very dense plantings that have occurred this structure is designed to intersect surface water and direct it into the ground. It is our possibly imperfect understanding that the ground below the bauxite layer is more permeable and so the groundwater level starts at a much lower base, takes longer to fill and so starts later and doesn't last as long.

We just wanted to add here that we have investigated this possibility with Alcoa and they have been open and helpful although in the end we remain uncertain. We should also add that the standards for the rehab were set in the 1960s when we had a completely different world in relation to water supply and catchment management compared to our current concerns. Times change.

There is no doubt what they have done up there is outstanding in the replacement of native forest plant species, but it is also reasonable to question this approach in the light of the present water supply issues.

So we checked it out as best we could.

Graph – Waroona Inflows

It is possible that the process just described is supported by the lower inflows after mining began until about the mid 1970s but then it flattens out and later increases for a while until another peak later on.

Hopefully someone is a lot smarter than us and can see a pattern or a consequence that we can't.

Graph – dam fill.

Just before we go further, this graph shows how dam fill works in our area. Many people think that is directly related to the total amount of rainfall we have had and while that is true to a certain extent but, in order of importance, it is actually about stream flow, which is related to runoff which is related to the groundwater level which is related to rainfall.

So you can see from this graph as you move out of our dry summers with reducing ground water levels it takes a while for the ground to wet up so that the most important rain events for our dams are those that occur at the back end of winter and into early spring when stream flow is most likely to occur and continue.

Graph – Inflows and allocations.

One of our most important decisions that we make each year, and coincidentally made this morning, is the allocation of water for each Water Year which runs from 1 October to 30 September. Irrigation can start as early as October and we reckon it is also about the time when the dams are at their fullest, on average.

So irrigators need to know how much water they are going to have for the season ahead.

Allocation means what percentage irrigators will have of their nominal water entitlement. So, for instance if their entitlement is 100 ML and the allocation is 40%, as it is for Harvey/Waroona this year, they will have only 40 ML to use.

Obviously the allocation is directly related to how much water there is in the dams which is related to inflow and so on as we have already mentioned.

The graph shows the combined inflows and allocations for the Waroona and Harvey districts which we are now able to run as one because of the gravity fed piping system.

And allocations are clearly trending down. It can be seen that when we took over in 1996 we had a bumper year and it has all been downhill from there.

The implications for irrigators are considerable although in low allocation years they have the flexibility to trade water between themselves and they have enough warning from Harvey Water to put more emphasis on conserved fodder such as hay and silage instead of irrigated pasture. Unfortunately lower allocations are a realty for them now but as all good farmers do, they are adjusting to it.

Effects of Low inflow Years (Graph)

What is trickier for us is that a really dry year that causes a low allocation takes two to three years to recover from. So as we learn more about this and climate change we are working very hard to manage supply so that we avoid these sharp dips that effect two to three years.

The green bars are obviously very low years but they also correspond to big El Nino years as they occur on the East Coast of Australia. To our eyes there is a low year every three to five years and we are working out how to include this in our predictive management of supply.

We have tried to get BoM interested in this as to whether there is a correlation there but they won't have it unfortunately. So, we think there is definitely a climate change effect and there is a medium term El Nino/La Nina effect which is likely layering over the mining/rehab effect.

And we have no idea how to separate these causes and to quantify them.

Effective Cost of Water

The table shows how both low allocations and a high percentage of fixed charges affect the actual cost per unit of water supplied. Of the $70.49 Fixed and Variable costs, those which Harvey Water controls are Variable ($28.19 or 40%) and Fixed ($16.02 or 23%) with the balance Fixed Charges ($26.18 or 37%) applied by Water Corporation.

So from an irrigator's perspective he is getting less water but paying more per Megalitre. On top of that if he has extra costs for his alternative feed sources such as conserved fodder production and extra costs if he wants to trade in water to use for irrigated pasture or crops.

Wellington Graph.

We had a think about all this and decided to see if we could find similar effects of tree removal and reveg in the inflows into Wellington dam.

What happened in the Wellington dam catchment is that in about the middle years of last century, clearing was allowed in the catchment. Ultimately of the 2830 sq km of catchment area, 667 sq km or 24% was cleared and by 2001 184 sq km or 7% was replanted, leaving about 17% still cleared.

The graph shows that as for other catchments there is a long term decline in inflow.

If we take 1955 as the nominal start of clearing we can see a bit of a bump up shortly after that may be related to increased run of but there isn't really any clear sign of reduced runoff due to replanting, probably because there hasn't been enough of it.

And the runoff trend is still down over the long term.

Salinity graph.

However if we take a look at the effects of clearing on salinity in the runoff it is very clear.

Salinity starts to increase quite noticeably in the late 1960s and by the late 1970s replanting was underway. The amount done was sufficient to halt the increase but not enough to reduce it from the present day approx. 1100 mg/l TDS, which is not quite brackish.

In trying to compare these effects back to Waroona, there has been no significant effect on salinity there with the quality being pretty good at around 200 mg/l TDS.

SUMMARY

So there you have it from our point of view.

We have observed some things, we think we know some other things but can't separate the multiple effects on inflows but we are trying to manage the negatives to provide a water supply that varies within a much narrower band than in the past 15 years. Help!!