INDIRECT POTABLE REUSE – POST TOOWOOMBA

Like many in the water industry, I too was disappointed with the result in the 29th July referendum in Toowoomba.

We all saw blatant misinformation and emotive language scuttle the initiative..but we also saw a Mayor with the courage to promote Indirect Potable Reuse (IPR) as a viable means of securing the future for Toowoomba; leadership that is not generally evident in our industry and it was very refreshing.

Yes, the vote shows that the community did not support the plan but what many forget is that there was a detailed 5 year testing and education programme included in the plans – all of which came to nought when the then newly appointed Parliamentary Secretary to the Prime Minister with responsibility for water policy linked National Water Initiative funding to a referendum – and making this decision at that stage showed him to be totally unaware of the potentially emotive issues embodied in the Waterfutures Plan.

As an aside, the result of the 'no' vote is that secondary effluent from the Toowoomba WWTP will continue to discharge into Gowrie Creek and be part of the water supply for downstream Dalby, for which I am sure the good folk in Dalby are eternally grateful.

Nevertheless, the coverage of the referendum result in the context of the on-going drought in Australia and in particular, the eastern seaboard of the continent, has to my mind been very encouraging; we now have State Government Ministers and State Premiers acknowledging that IPR is occurring in their States, albeit in an 'unplanned' or 'inadvertent' manner. Everyone now knows that the water that the good people of North Richmond in NSW have been drinking for decades originates from a raw water that can contain up to 30% of tertiary treated effluent from Sydney Water's Penrith WWTP … and there has been no public report of abnormally high incidences of acute or chronic illnesses in the area served by the North Richmond water treatment plant.

A paper presented at Enviro06 in Melbourne in March this year analysed the situation at North Richmond in the context of the draft National Water Recycling Guidelines that were released for public comment in October 2005 [1]. The authors showed that by increasing the level of treatment at the Penrith WWTP to that associated with a 'planned' IPR scheme, the safety of the water would be increased some 1,000 times over that currently produced, distributed and consumed in the North Richmond area.

Given then that it is now publicly acknowledged that 'unplanned' IPR occurs in many parts of Australia and that there have been no reported adverse health impacts in the populations served, how is it then that some water professionals still raise concerns over its application in a more 'planned' fashion ? An example of this could be found on the ABC website after the Toowoomba referendum where an eminent professional stated that "I'm glad the community in Toowoomba rejected it because I don't think we are ready for it" – and this from a person who lives at the end of the Murray River !

I sense a groundswell of professional opinion that 'planned' IPR *is* a safe option that should be addressed along with others when evaluating sustainable future water supplies. It will certainly not be applicable in all instances but it should nevertheless be considered and not ignored for reason of likely community rejection, as did recently happen in one of our major coastal communities.

It is now time for WSAA and the AWA to become more visible and reinforce this message to our political leaders, their advisors, doubting water professionals and the general public.

The AWA, and in particular its Queensland Branch, is to be commended for running a public forum on Water Recycling in Toowoomba in the lead up to the referendum and the Association should build on the exposure it attracted through this initiative. WSAA, on the other hand, was conspicuous by its absence during the months leading up to the referendum. Granted that Toowomba City Council is not a member of WSAA, but it is submitted that the events played out in Toowoomba will have some impact on its members, particularly as many of them are currently having to cope with increasing populations and dwindling water supplies.

Now for the doubters, let's look at the facts:

1. Technology and Operational Reliability

The May 2003 edition of *Water* contains a paper entitled "Advanced Reuse – from Windhoek to Singapore and Beyond" [2]. This paper highlights four Potable Reuse schemes and discusses the technologies applied at each of the plants. It shows that apart from the plant at the Upper Occoquan Sewerage Authority in Virginia, US that has been operational since 1974, the other three incorporate membranes in their treatment trains.

Reliability of operation and product water quality is always assured through appropriate on-line instrumentation and the adoption of the principal of 'multiple process barriers'. The first of these 'barriers' is the WWTP itself and we now know that this stage of treatment is very important in the removal of chronic health parameters such as endrocrine disrupting compounds (EDCs), of which hormones is but one player.

Research work overseas [3] and within Queensland, Australia [4] has shown that activated sludge treatment using long Solids Retention Times (SRTs) and coupled with bio N removal achieve high levels of EDC removal. The Queensland work showed that 'activated sludge treatment was very effective at removing EDCs from sewage' and it also noted that the comparatively higher levels of EDCs reported in effluent in the UK may well be due to the fact that trickling filters are still widely used as the form of secondary treatment in that country.

Figure 1 summarises the reductions in estrogenic and androgenic compounds through WWTPs in Queensland showing the importance of this first process barrier.

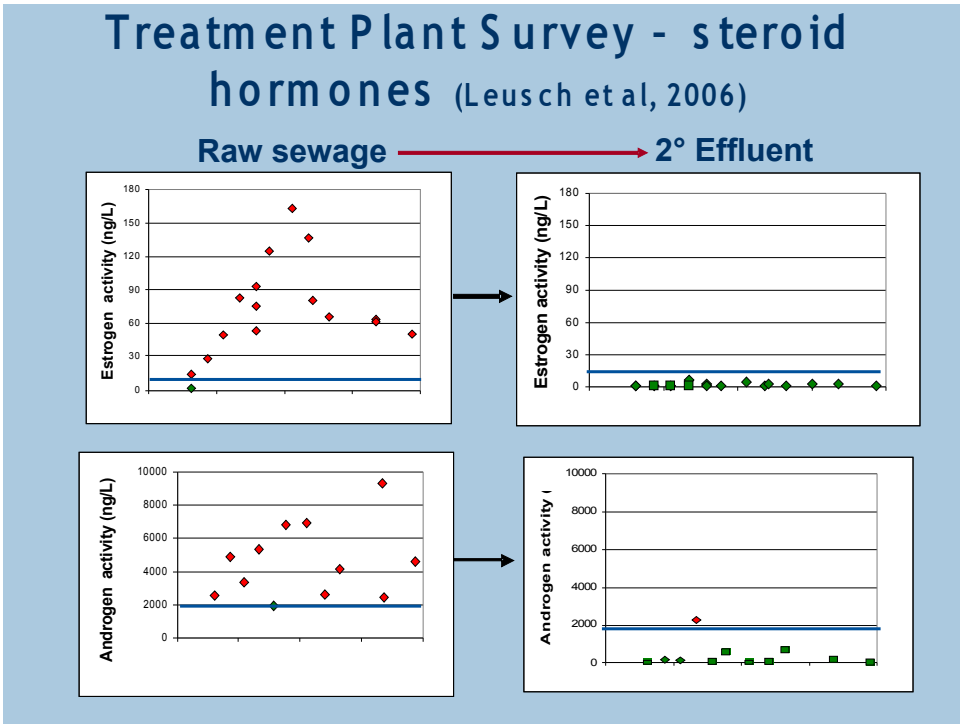

Figure 1: Removal of Hormones in Queensland WWTPs

Researchers overseas [5] and in Australia [6] and have also shown that reverse osmosis (RO) is very effective in further treating secondary effluents and removing any remaining large molecular mass organics that might still be present in such waters, such as hormones and Pharmaceutically Active Substances (PhACs).

There are also now significant data bases of analytical results in the US, Europe and Singapore to show that dual membrane plants (micro- or ultra-filtration followed by reverse osmosis) followed by ultraviolet disinfection and/or an advanced oxidation process will produce a reclaimed water that can be safely added to a raw water storage – be it a surface reservoir or a groundwater aquifer.

2. Acute Health Risks

The Draft National Water Recycling Guidelines (October 2005), the Queensland Water Recycling Guidelines (December 2005) and operational/test results from San Diego and Orange County in the US and the NEWater plants in Singapore show that dual membrane water reclamation plants that include a UV disinfection stage will achieve virus, bacteria and protozoa Log Removal capabilities of 10, 14 and 14 respectively [1].

It can be concluded that the acute health risk in using such reclaimed water as a raw water source is absolutely minimal.

3. Chronic Health Risks

Much of the scaremongering in Toowoomba revolved around the presence of hormones in the reclaimed water – a cry then taken up and carried forward by the Queensland National Party Leader in recent times.

The fact of the matter is that a global assessment of the state of science on endocrine disruption that was published in 2002 concluded that there is no evidence of risk to humans from hormones in water [7].

Dr Heather Chapman, the Program Leader of the Sustainable Water Sources program at the CRC for Water Quality and Treatment has stated that while there have been some reported hormonal impacts on fish and wildlife in Europe and the UK, there is no evidence to show that the effects in fish can be extrapolated to effects in humans [8]. We all ingest high levels of hormones though medication (eg. the contraceptive pill), through our food supply (eg. phytoestrogens in soya beans) and in comparison the quantities of hormones or hormone mimics in drinking water are absent or negligible. Readers are referred to the paper by Chapman and Leusch on page … in this edition of *Water* for further discussion on this topic.

In addition, the dual membrane technology in a water reclamation plant reduces hormones, pharmaceuticals and other EDCs to levels that are below detection limits … and then this water is blended and stored in raw water storages before undergoing further treatment in water treatment plants, and thereby further reducing any chronic risk.

An example of the reduction in chronic risk achieved through planned IPR can be taken from Orange County, California where a suite of organic compounds are used as 'signature compounds' for contamination of surface waters by municipal wastewaters that contain industrial discharges.

Figure 2 compares the occurrence of these organics in the Santa Ana River in southern California (the raw water source for the area) with the Orange County Sanitary District secondary effluent (the feedwater to the Water Factory 21 water reclamation plant) and the permeate from the reverse osmosis plant at Water Factory 21 [5].

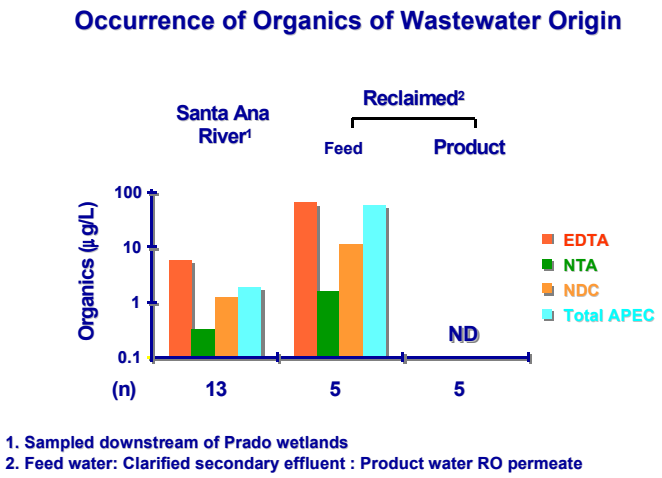

Figure 2: Occurrence of Organics of Wastewater Origin

This Figure clearly shows the higher quality of the reclaimed water as compared to the Santa Ana River and lends support to the concept of planned indirect potable reuse.

Closure

However, we can have the most effective and reliable treatment technology and the most supportive professionals but we will still be debating what to do when the taps run dry unless we recognise that we must now have the leaders who are prepared to enter into active partnerships with the general community and ensure that all options for future sustainable water supplies are carefully canvassed and considered. The days of petty politics are over.

I believe that we are starting to see this leadership arising from the events in Toowoomba; no doubt aided by the fact that the drought is tightening its stranglehold in many parts of our country.

Let's all learn something from the Toowoomba fiasco.

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