This bioassay measures DNA damage or genotoxicity. Bars indicate the results of this bioassay in four seasonal samples from each of raw, primary, secondary and reverse osmosis treated effluent.

The level of activity that was detected in raw wastewater was completely removed through the treatment process, with no observed activity for samples treated by reverse osmosis.

The results show that:

- Raw wastewater had both significant concentrations of chemical contaminants as well as biological activity.
- The multiple barrier approach for wastewater treatment at Beenyup effectively removes all biologically active compounds and hence their related biological activity.
- Reverse osmosis was an effective barrier to biologically active compounds. None of the chemicals monitored in this study were detected in water treated by reverse osmosis. Genotoxic, phytotoxic and androgenic activity were likewise not detected in reverse osmosis water. The low level phototoxicity that was detected in two out of four reverse osmosis treated samples is a result of the extreme sample concentration carried out for testing and not indicative of actual toxicity in the samples.
- The bioassay results are in agreement with the trends in contaminant removal during each stage of the treatment process that have been observed using chemical analysis.

This study has demonstrated the usefulness of combining multiple lines of evidence when assessing water quality. The toolbox developed in this project shows promise for application to water recycling initiatives with a range of end uses and allows a better understanding of the water quality issues involved. Validation and implementation of the toolbox for a variety of case studies is the next step to further verify and promote the utility of this approach.

This summary is based on data contained in the following report:


More information

The full report and more information on water recycling are available from the Department of Water’s website: www.water.wa.gov.au/Managing our water=Water recycling=Ecotoxicity toolbox.

For more information contact the Water Science Branch of the Department of Water.

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The following graphs and comments describe the results of the various bioassays undertaken. In the graphs, where there are two dashed lines, the lower dashed line indicates the limit of quantification, with "BQL" indicating those samples that were below the quantification limit. "RO" means 'reverse osmosis treatment'.

This bioassay measures androgenic activity, which at high concentrations could cause feminisation of exposed organisms.

Bars indicate the results of this bioassay in four seasonal samples from each of raw, primary, secondary and reverse osmosis treated effluent. Data is presented as andropause equivalents.

There is a clear reduction in activity through the treatment process, with no observed activity for samples treated by reverse osmosis.

This bioassay measures estrogenic activity, which at high concentrations could cause feminisation of exposed organisms.

Bars indicate the results of the bioassay in four seasonal samples from each of raw, primary, secondary and reverse osmosis treated effluent. Data is presented as estradiol equivalents.

There is a clear reduction in activity through the treatment process, with no observed activity for samples treated by reverse osmosis.

This bioassay measures herbicide-like activity, also known as baseline toxicity or toxicity to plants, in which photosynthesis in plants is inhibited.

Bars indicate the results of the bioassay in four seasonal samples from each of raw, primary, secondary and reverse osmosis treated effluent. Data is presented as diuron equivalents.

There is a clear reduction in activity through the treatment process, with no observed activity for samples treated by reverse osmosis.