Showcase

Title: **Treatment of secondary effluent to drinking water standards at Beenyup Wastewater Treatment Plant**

Sector: Wastewater:

- ☐ drinking water sources
- ☐ drinking water treatment
- ☐ drinking water distribution
- ☒ wastewater collection / influent
- ☒ wastewater treatment
- ☐ wastewater effluent / receiving water
- ☐ other

Utility: **Water Corporation, Western Australia**

Date: 2012

Introduction & Background Information

Approximately 9ML/d of secondary effluent from Beenyup WWTP is taken as raw water for an Advanced Water Recycling Plant (AWRP). This effluent has ammonium concentrations between 0 and 8mg/L depending on inflow to Beenyup WWTP, with peak flows on weekends.

The AWRP takes secondary effluent, chloraminates it and passes it through UF membranes, RO and UV disinfection to produce water of drinking water quality which is recharge into the Leederville (confined) aquifer.

Water Quality Challenges

The Beenyup wastewater catchment is predominantly domestic but with one major hospital. Treated wastewater from the Beenyup wastewater treatment plant is treated to a standard suitable for discharge into the ocean.

The technical challenge was to treat this water to drinking water standards, and a key issue relating to this was to provide regulators, government and the public with sufficient confidence to support the expansion of the trial.

The treatment train adopted was successful in demonstrating that drinking water quality could be consistently achieved.

Approach and Implementation

Online monitoring was critical to the success of the trial in that it allowed Water Corporation to demonstrate that performance was being monitored 24 hours a day 7 days a week, and that no water was recharged if the plant was not performing to specifications.

Development of the monitoring programme

The monitoring programme for the AWRP was derived from a three-year project undertaken in partnership with the Department of Health, which defined the recycled water quality parameters requiring monitoring to demonstrate mitigation of the hazards identified for local conditions, and an indicator suite of eighteen chemicals which represented not only the much larger list of RWQPs but also chemicals of similar chemical composition not monitored for.

The monitoring programme for groundwater was developed by technical personnel from the Water Corporation in liaison with other technical experts from e.g. CSIRO, and also with input from Department of Water.

Systems, methods, and monitoring instruments

Monitoring instruments included a Hach ammonia analyser, Hach monochloramine analyser, Hach turbidimeter, Endress & Hauser pH & conductivity probes. Ammonia and monochloramine are colorimetric methods with the others being direct measurement. Instruments were connected to SCADA and can be monitored via ViewX.

Project Execution and Delivery

Water Corporation had been considering groundwater replenishment as a potential source, and in 2005 sought strategic advice from the Environmental Protection Authority (EPA) on the opportunity (Bulletin 1199). The EPA advised that the concept had merit for local conditions, but that a trial should be undertaken in a low-risk area remote from existing, drinking water supply bores prior to consideration of any operating scheme.

The Health Department and Water Corporation resolved that drinking quality water was required prior to recharging the water. The key reasons for this were:

- water was being recharged to a gazetted drinking water source, and it was imperative that Water Corporation demonstrate that the source was being protected, in alignment with catchment protection policies applicable throughout the state
- The Health Department required that hazard mitigation be demonstrably managed in achieving the required quality, and thus that treatment processes to deal with the specific hazards identified be in place. This meant that relying on the aquifer to clean up the water was not an option.

Water Corporation considered recharging both the superficial and confine aquifers but resolved to recharge the Leederville confined aquifer for a number of reasons:

- a suitable location for recharge of the superficial aquifer that would not impact on existing users could not be identified
- the very large number of other users in the superficial aquifer did not provide confidence that water allocation benefits derived from recharge could be guaranteed.

Costs and Maintenance

Maintenance costs varied dependent on the instrument. For example, ammonia and monochloramine analysers required ongoing replacement of reagents where pH probes did not require reagents. Online instruments were maintained by electricians with cross-checks between online and lab instruments performed by Operations. Lab instruments were maintained/ calibrated by scientists.

Data Handling

Reporting was via PI and MS Excel. Alarms were handled centrally and addressed by the standby coordinator. Automatic shutdown of plant on CCP breach was via SCADA.

Quality Assurance / Quality Control

Comparison between online results and lab results was undertaken routinely.

Operational Changes

The use of online sensors allowed for the automation of rejection of out-of-spec water. For example, if the ammonia in the feed water exceeded the alert level, a dump valve opened to reject this water. This process was followed throughout the treatment process in AWRP to ensure that only suitably treated water passed to the next stage of treatment.

Evaluation of Successes and Limitations

The key benefit obtained from the online monitoring was the capacity to provide the business, regulators and government with confidence that the treatment process always performed to the required standards.

Some limitations were experienced, in that there were three water quality events experienced in the three-year trial period. These were all of short duration, did not impact on water quality in the aquifer, and in fact increased trust in the Water Corporation due to details of events being made public by media releases, posting of details on the groundwater replenishment website, etc.

Lessons Learnt

These incidents, however, were not associated to instrument problems. They were related to maintenance, incorrect set points or valves that did not return to the right positions.