IMPLEMENTATION OF TEMPORARY WATER FILTRATION AT BRIGHT

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ABSTRACT

Bright is a sub-Alpine tourist town located in North East Victoria. The Bright water supply is directly taken from the Ovens River with Chlorine disinfection only. Historically, the water quality has met the Australian Drinking Water Guidelines turbidity standard, however since the 2003 and more recent 2006/07 bushfires, the water quality has declined, with sustained turbidity levels exceeding 5 NTU. Ongoing Boil Water Notices and numerous customer complaints led to North East Water implementing temporary filtration at Bright.

This paper scopes the planning, construction and commissioning of a 3ML/day containerised filtration WTP at Bright.

KEY WORDS

NEW (North East Water), ACH (Aluminum Chlorohydrate / *Megapac-23*), NTU (Nephelometric Turbidity Units), Pt-Co (Platinum-Cobolt Units),

1.0 INTRODUCTION

1.1 Drought & Fires in North East Victoria

Like most of Victoria and Southern NSW, North East Victoria has experienced persistent drought over previous decade. During 2005/6, drought impact on the Ovens River system became critical, with bans on irrigation, pumping of low level "dead water" from Buffalo reservoir and severe residential restrictions in place. The township of Wangaratta was facing a "water crisis", with river supply potentially exhausted during Autumn of 2007.

North East Water (NEW) took the action of drilling additional bores to ensure supply could be maintained once the forecast river supply had ceased. With Iron, Manganese and Arsenic presence in the groundwater, a decision that filtration with DMI-65 media would be most suitable to achieve potable quality. NEW engaged Amiad to package containerised (for future flexibility) filtration plants capable of delivering 30 l/s per bore (x2) within the ADWG limits. In total, four shipping containers were purchased, with a "Master & Slave" unit for each bore.

The filtration plants were commissioned, and delivering compliant water from the bore supplies. Fortunately, rainfall in the catchment relieved the urgency of the project, however the contingency bores and filtration plants have secured Wangaratta water supply.

During this drought period, the North East also experienced two significant bushfire events, both affecting the Ovens River Catchment. Since the 2006/07 bushfires, the majority of subsequent rainfall has caused significant turbidity spikes in the Ovens River,

particularly in the upper reaches.

Figure 1: ***Filter & chemical storage within a container***

1.2 Bright Water Supply

The tourist township of Bright is located on the upper-mid reaches of the Ovens River, in which potable water is primarily supplied directly from the river. Bright drinking water has been a "disinfection only" supply, using Chlorine gas. Chlorine is directly added into a basin adjacent to the Ovens River, which is then pumped to the reticulation and a high level storage. The Bright water supply also services the adjacent smaller townships of Porepunkah and Wandilagong.

In previous years, elevated turbidity events due to catchment rainfall could be managed via town's treated water storages and a small secondary supply. Typically, elevated turbidity would not be sustained, and would reduce to approximately 1-2 NTU, which was deemed suitable for potable supply.

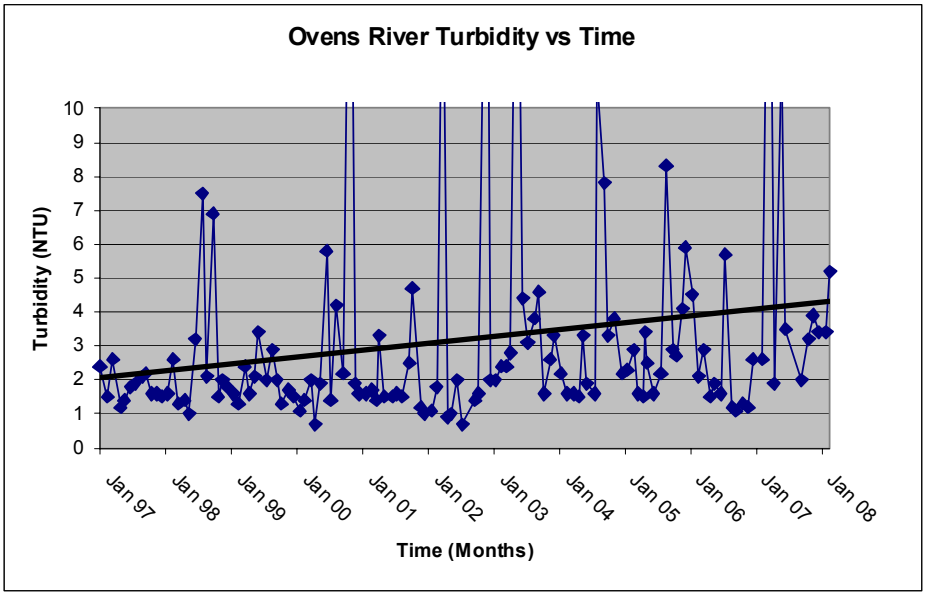

Figure 2: ***Ovens river turbidity data since Jan 1997***

Figure 2 above shows monthly turbidity data from the Ovens River, which highlights both an increase in average turbidity levels and frequency of elevated turbidity events in recent years.

During Feb 2008, significant rainfall in the catchment (> 100mm) resulted in sustained dirty water, triggering NEW to implement a Boil Water Notice. River turbidities did not fall below 5 NTU for weeks after the rainfall, which prompted discussion and planning for a filtration facility (March 2008).

2.0 DISCUSSION

2.1 Project Objectives

To clarify the expectation of the project, the following objectives were established:

1. To be able to treat the Ovens River Water at Bright to potable standard, minimising the requirement to implement future boil water notices
2. to implement a temporary (semi-permanent) installation that achieves object 1, until a permanent upgrade is installed ~ 3-5 yrs
3. to primarily treat water 5-20 NTU, typically the WQ that is sustained 24-48 hours post storm event

The following data was used to design the filtration capabilities:

- Ave Turbidity Range: 2 – 20 NTU
- Peak Turbidity: 50 NTU (24hrs after peak slug)
- Iron: 0.5 – 1.0 mg/l
- Manganese: < 0.05mg/l
- Ave Flow: 1.0 – 2.0 ML/d
- Peak Flow: 3.5 ML/d

2.2 Site Selection & Planning

Selecting the site to locate the containerised filtration plants was obvious, however was not within an existing NEW compound. The site selected was adjacent to the existing Chlorination facility (away from the HV lines!). This site is an existing arboretum (tree reserve), which is owned and managed by DSE, and therefore required formal permission to establish the containers. Approval was gained within three weeks of seeking formal permission (18 April 08). Local council was also informed, and did not object to this project.

A project plan was developed, which scoped site preparation, relocation of the containerised units, technical aspects (eg. Pumping, Coagulation, filter media selection, control and monitoring), construction and commissioning of the filtration units. It was estimated that the plant would be commissioned in approximately 8 weeks once permission was granted from DSE.

A budget estimate of < $100,000 was prepared for the project, and endorsed by NEW Executive Management Team. The major items included a raw water pump, pipework (material & fabrication), electrical components and security fencing. In-house resources from both operations and electrical departments were to be utilised to minimise costs and ensure timely completion.

2.3 Construction

With DSE approval, works immediately started at the Bright site constructing a foundation pad. The containers at Wangaratta were dismantled and the existing filter media (DMI-65) removed leaving only a 350mm support base to assist in the removal of Iron and finer particles.

Despite removing the DMI media, each container still weighed in excess of 20 tonne. With winter approaching, potentially restricting access at the arboretum, the containers were quickly transported via side shift transport. The containers were placed onsite with minimal damage to flora and grounds which was a requirement specified by DSE.

Next, fabrication works were carried out for the connection of backwash, raw and filtered water lines. Also control and electrical services were installed.

Media (Anthracite) was craned onto site placing a 500mm layer in each of the 8 vessels and soaked. Installation of a raw water pump to existing infrastructure was carried out, as well as a static mixer and relevant dosing points.

Figure 3: ***Stainless steel pipework, fabricated and installed on-site***

The cleaning of the existing clear water storage (aka "Frog-hole") was supposed to be a straightforward exercise, however became quite a challenge. This entailed the removal of approximately eight cubic metres of sandstone, which had to be broken into pieces, and hand bucketed up the embankment. This resulted in an "all hands on deck" approach to achieve this goal.

2.4 Commissioning & Operation

Day 1 of commissioning (1 July 08) was not ideal, with in excess of 50mm of rainfall and the Ovens River supplying >100 NTU and colour >200 Pt-Co, at 7 degrees Celsius.

With electrical staff adjusting PLC programs and operational staff jar testing, checking pump rotations and calibrating instruments, the plant was placed on-line knowing full well that capabilities would be tested with the poor raw water quality. With limited optimisation, the plant was able to reduce turbidity from 140 to 5 NTU, requiring a dose

rate of 30ppm (v/v) ACH.
The following day presented much more optimism, with raw water quality 15 NTU / 30 Pt-Co. The process was optimised to achieve filtered water 0.5 NTU at a dose of 6ppm (v/v) ACH, at a flow rate of 38l/s. This dosage was later reduced to 3ppm (v/v), as the raw water turbidity decreased to 10 NTU.

All automation and control features were tested with slight changes to backwash sequences, and operating parameters were functioning properly.

During the following 48 hours, the filtration plant was producing water with the following quality parameters:

- Turbidity: < 0.3 NTU
- pH: 6.9
- *sol* Al: 0.01mg/l
- Fe: 0.02 mg/l
- Colour: 0 Pt-Co

The flow rate through the plant was 134kL/hr, with filter runs of 12 - 24hrs, and a filtration velocity less than 9.8m/hr. Backwash flow rates were 80.4L/hr with a velocity of 40m/hr with only 3% efficiency losses at this stage..

The fully automated process was essentially commissioned within 2 weeks, including operations staff training. Immediate improvements within the reticulation were observed. The clean water resulted in a reduction of Chlorine dose by a one third, as well as sustained Cl_2 residuals in the reticulation. Reticulation extremities, and the adjacent towns were recording Cl_2 residuals that were unprecedented.

The decision was then made to lift the boil water notice, which had been in place for approximately 6 months, which was the ultimate goal of the project.

3.0 CONCLUSION

Within 3 months of attaining DSE approval, NEW operations & electrical group were able to install and commission a 3 ML/d fully automated filtration plant at Bright, delivering compliant potable water. Although acknowledging that NEW owned containerised filtration units, technical and site challenges were overcome with in-house expertise, limited budget and a motivated team ensuring customers are provided with safe drinking water, and alleviating the requirement for boiling drinking water.

4.0 ACKNOWLEDGEMENTS

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