# MEETING WHO GUIDELINES FOR DRINKING WATER QUALITY AFTER THE 2003 BUSHFIRES IN NORTH EAST VICTORIA

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# MEETING WHO GUIDELINES FOR DRINKING WATER QUALITY AFTER THE 2003 BUSHFIRES IN NORTH EAST VICTORIA

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## ABSTRACT

January 2003 saw some of the worst bushfires ever experienced in the North East of the State. The fires burnt for more than a month and burnt out an area of 1.1 million hectares. These fires caused major concerns for Authority staff in our Alpine region when the demand for water rose by up to five times normal consumption in some towns as people went about trying to protect their properties. On top of this our staff also had to protect our pump stations and treatment facilities so water would continue to flow into the reticulation system.

Staff members from other regions in the Authority were called in to assist in running a 24-hour roster, which was maintained for a few days until the threat had past. Once the flames were gone and we were left with a smoky haze and a charred landscape, our troubles were not all gone.

**Figure 1:** ***Charred bushland near Beechworth***

**Figure 2:** ***Smoke haze over Wodonga's Huons Hill WTP.***

## KEY WORDS

2003 Bushfires, World Health Organisation (WHO) Guidelines, turbidity, Wangaratta, Ovens River, Buckland River, NTU.

## 1.0 BACKGROUND

Once the main threat of fire had passed, we had a meeting to debrief on events to date. The aim of the meeting was to discuss how we would approach the problems that we were likely to experience after rainfall caused run-off consisting of silt, saps and eucalyptus oils into the rivers that we draw from. Our discussions covered all the towns in the Alpine area, and also Wangaratta as it draws from the Ovens River approximately 100 km downstream from the Buckland River junction. The main concern was whether we would have enough storage to see the dirty water flow past our offtakes. Some towns such as Corryong have significant storage capacity and were not considered to be an immediate concern. Wangaratta, however has only eight hours' supply capacity during summer.

We discussed the option of carting water to the smaller towns, but this was not practical for Wangaratta, which uses around 35ML per day at that time of the year. We made tentative plans for all towns and it was expected that by the time the dirty water travelled 100 km downstream it would have settled out to a reasonable quality so it could be treated at Wangaratta. Operators at the Wangaratta plant doubted the slug would settle out totally as they had experienced some runoff water from a controlled burnoff in Morgans Creek catchment just above Bright back in November 2002 after a localised storm. On that occasion the water that ran into the Ovens River was quite dirty and had a turbidity of 100 NTU when it got to Wangaratta.

## 2.0 THE PROCESS OF WATER TREATMENT AT WANGARATTA

Fortunately the Wangaratta Treatment Plant consists of two plants, a conventional Upflow Clarifier Plant that has pressure sand filters. In 1983, to keep up with demand in the summer, a Direct Filtration Plant was built. When the dirty water from the controlled burnoff arrived, two of the pressure filters were offline and the Direct Filtration Plant was in use. However as it can only handle water up to 30 NTU, it was decided to investigate running through the clarifiers and then into the Direct Filtration Plant to filter the water. Operator Brian Scobie believed this was possible, so he set about opening and closing valves that were rarely used. After some time he had achieved this and then had to adjust the valves to control the flow. The plant was run like this for several days

## 3.0 A ONE-IN-FIVE-HUNDRED-YEAR STORM

### 3.1 Wednesday

I don't think anyone could have predicted what happened when it did rain.

It is well documented that on 26 February 2003 a microstorm dumped 150mm of rain over a 10 to 15sq km area in 20 minutes. Sadly one firefighter lost her life as she was washed away by a wall of water about 2m high flowing down Dingo Creek at an estimated speed of 25km/h. The runoff carried everything on the ground with it and devastated the river banks and any structure in its path. Early reports had readings that the wall of water in the Buckland River was as high as 3m.

### 3.2 Thursday

On 27 February, we received a call to inform us that the storm had raised the turbidity to 129,000 NTU and that the river looked more like syrup than water. We quickly headed up the river to find the front of dirty water and collect samples so we could conduct some early jar tests to see if or how we could treat it. The turbidity of the samples ranged from 40,000 NTU to 70,000 NTU. Preliminary tests proved that if we used Megapac 23 instead of Aluminium Sulphate that we could treat up to 16,000 NTU. The next important questions were when the front would arrive in Wangaratta and how long it would take to pass.

We had discussions with North East Catchment Management Authority and Goulburn Murray Water. Their predictions were that the dirty water front would arrive either late on the evening of Thursday 27 February or early on Friday the 28 February.

After travelling up and down the river collecting samples our prediction was that, with no large flows in the Ovens River to push the front on, we wouldn't see this slug of dirty water for a few days. Nevertheless we staffed the plant all night to monitor the river in case our prediction was wrong.

## 3.3 Friday

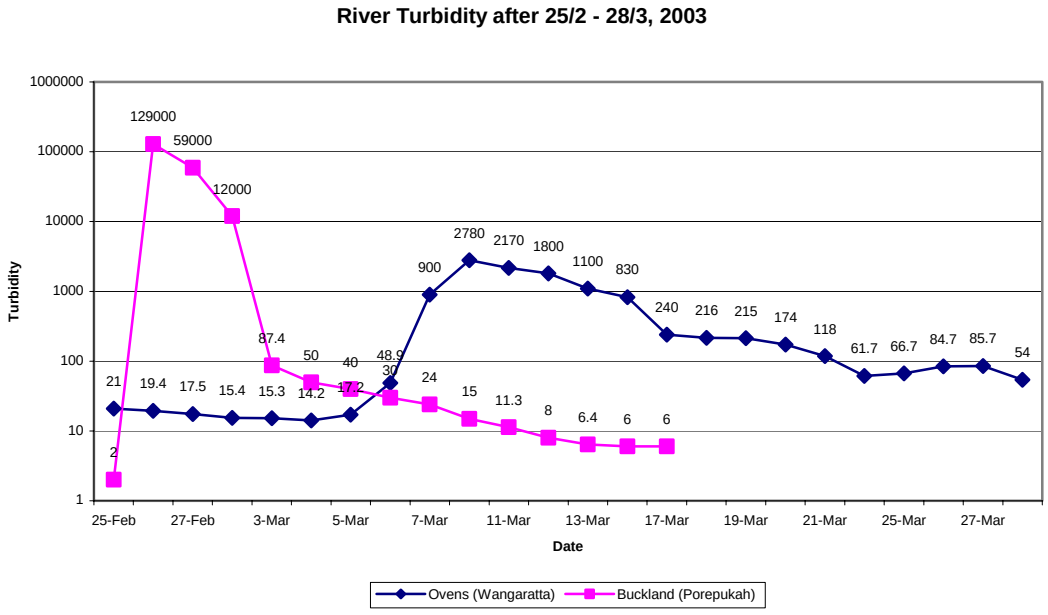
Friday morning came and the water quality was still OK in Wangaratta. The main front had reached Whorouly, about 75 km up river. This meant we needed to get a tank and a delivery of Megapac 23 on site so that when the dirty water arrived we would be able to treat it, as long as it wasn't more than 16,000 NTU. We contacted our chemical supplier, Omega Chemicals, and they were able to arrange a tank container with 10,000 litres of Megapac 23 for first thing on Saturday 29 February.

## 3.4 A Working Weekend

Over the weekend we continued monitoring the river and testing with different polymers to see if we could find one that worked better. We found that the poly we use on our DF plant was the best. We also began testing for manganese and alkalinity, and found that these were very hard to determine as we couldn't pick a colour change, and diluting with deionised water on the alkalinity test affects the test significantly. We set about putting an injection point into our clarifier plant as it didn't currently use poly, and we also had to connect our Megapac tank into our dosing pump lines.

These works were done, and then our electrical department set the plant up to run our dosing pumps and flow pacing up off the one flow meter. This took some time and they tried several combinations before it worked correctly. As is usually the case with electronics, when you make a change it causes a problem somewhere else.

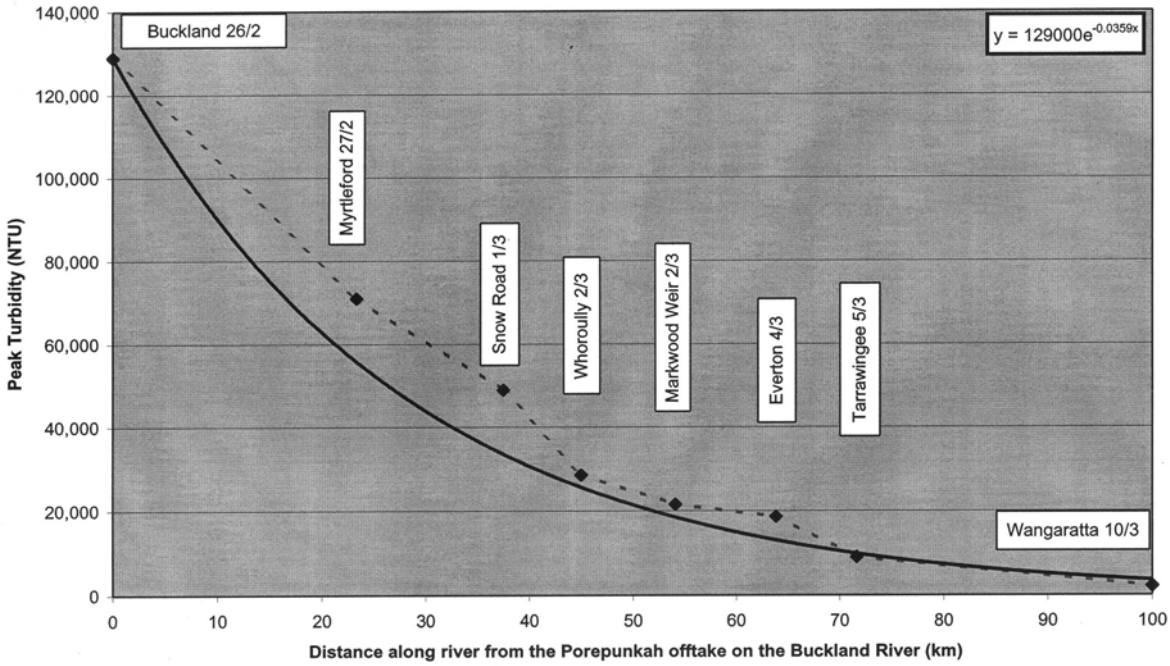
**Figure 3:** ***River Turbidity Levels in the Ovens & Buckland Rivers Following the Microstorm***



## 3.5 Wednesday

It was now decided that the main front of dirty water would arrive on about Thursday 6 or Friday 7 March. Over the next few days we continued jar testing and monitoring the river and the steady decline in the turbidity as the slug travelled downstream towards Wangaratta. By Wednesday the front was down to 1,000 NTU and just a bit further up the river was 5,000 NTU. Conversely, the turbidity at Wangaratta was steady and likely to increase in the next 24 hours; our best prediction was that the dirtiest water we would get was in the range of 2,000 to 4,000 NTU. We concentrated our jar tests on this range and were quite pleased with the results - we believed we would be able to produce water at a quality similar to normal operation.

**Figure 4:** ***Decrease in Peak Turbidity as Dirty Water Passed Down Ovens River 26.2.03 – 11.3.03***




## 3.6 Thursday

On Thursday 6 March we drained the alum dosing lines and flushed them out before changing to Megapac 23 and beginning with the poly dosing. At this point the raw water quality was:

| | | |
|---|---|---|
| **Water Quality** | Turbidity | 48.9 NTU |
| | ph | 6.74 |
| | Colour | 76 Hazen units |
| | Alkilinity | 20 |
| **Dose Rates** | Megapac 23 | 12.5 ppm |
| | Pre S / Ash | 9.0 mg/L |
| | Poly | 0.04 mg/L |
| | Post S / Ash | 5.0mg/L |

We found that the only way we could calculate the dosage of Megapac was to use a ppm volume / volume formula as opposed to a mg/lweight per volume formula.

### 3.7 Friday 7 March 2003 – The Big Day

On Friday 7 March, the dirty water finally arrived. At 7.30am the turbidity was 437 NTU and rising rapidly. Previously we had decided to run the plant at 210 L/s. We soon noticed our storage levels were decreasing rapidly, so after some discussion we decided to increase the flow through the plant to 260 L/s to try to keep up with the demand. This went well and everything appeared to be going to plan. We were conducting regular jar tests, and were taking a treated water sample out of the inlet pipe and seeing how well it would floc and settle.

**Figure 5:** ***Treatment Team Contemplates Pptions with the Turbid Ovens River in the Background***

At 12 noon, a routine inspection of the clarifier showed it looked terrible; the sludge blanket had lifted up almost into the launder troughs. By the time I got back into the lab the settled turbidity had jumped from 0.7 NTU to 25 NTU and we had no choice but to shut the plant off until we could work out what caused the problem. Turbidity tests from the top of the clarifier were around 100 NTU and there were many tiny dead fish floating around. There was also a white frothy substance floating on the top of the cells in the Direct Filtration Plant.

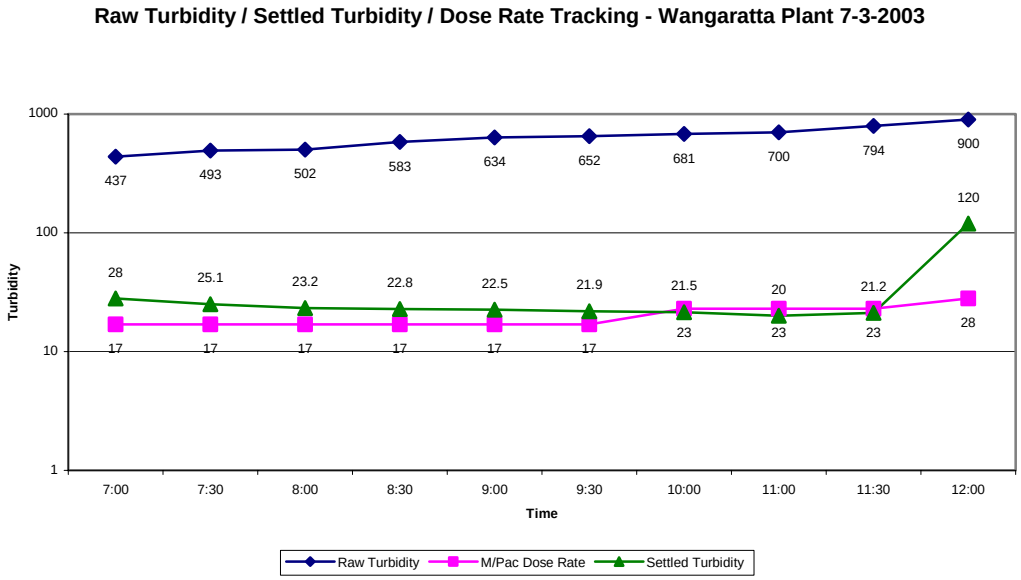
Immediately we contacted our Treatment Technologist, Mark Samblebe and he arrived at 1.30pm to assist us to find a solution. During the afternoon we contacted the Operations Manager, Bruce Gardiner, Technical Services Manager, Don Jackson, and Chief Executive, Jim Martin, who set about implementing our emergency response procedure upon their arrival at the plant. This involved contacting the council, police and media, all of whom responded positively and assisted where possible. TV and radio stations were asked to arrange broadcasts to advise of emergency stage four restrictions effective immediately to lower consumption. We believed that if consumption continued at the existing rate, Wangaratta would have run out of water by midnight. To alleviate community concerns, we tankered water from Benalla to the Wangaratta storages, and set up a tanker to supply drinking water to the public at Bachelors Green.

Goulburn Valley Water provided their water quality specialist who has experience with a similar upflow clarifier plant. By Friday evening the turbidity was 1400 NTU and we had worked out the right dose rates and believed that the plant could produce water of acceptable quality. However we believed we would have to run the plant and dump the

water back into the river until the turbidity at the top of the clarifiers was at an acceptable level to put it through the Direct Filtration Plant.
We restarted the plant at 11pm, and it was 5am before water was running into our very low storages.

| | | |
|---|---|---|
| **Water Quality** | Turbidity | 1400 NTU |
| | Ph | 6.5 |
| | Colour | Not known |
| | Alkalinity | Not Known |
| **Dose Rates** | Megapac 23 | 28 ppm |
| | Pre S / Ash | 9.0 mg/L |
| | Poly | 0.28 mg/L |
| | Post / Ash | 5 mg/L |

**Figure 6:** ***Turbidity and Dose Rates at Wangaratta***




## 3.8 The Labor Day Long Weekend to Remember

The following Saturday morning dawned and the nightshift operator was happy to be relieved. The dayshift continued with the regular jar tests and half-hourly treated water tests as the turbidity was continuing to rise and we didn't want a repeat of the previous day's incident. Things were going well. Then the media invaded: three metropolitan TV stations and two local newspapers who wanted to take shots and footage in the lab and outside on top of the clarifiers. Jim Martin and Bruce Gardiner handled most of their questions and the operators only had to deal with a few technical questions.

The Department of Human Services requested that we notify them if our treated turbidity went over 1 NTU and also to test for *E.coli* in a few locations around the reticulation system. With only three operators in Wangaratta, we only had enough staff for one per shift, so we had to get additional staff from Benalla and our central region to fulfil all our testing and operational requirements. We continued to staff the plant around the clock for the next 10 days, and then went to a split shift with overlap from 7am to 11pm for another seven days. During that time our turbidity peaked at 2,780 NTU and then

dropped back to a much more manageable 50 NTU about 17 days later.

We found that even though we could treat the dirty water, it caused a few problems along the way. We were producing 11 ML per day, and as a result we produced just over 1 ML of sludge and the plant was unable to discharge this in the normal way.

We tried unsuccessfully to leave the sludge cones open manually, so we opened the disused sludge weirs. This still didn't alleviate the excess, so we decided to dump each clarifier out of the manual valve in the base each morning for 10 minutes. This worked well as the plant had usually been off for two or three hours and we could manage the rest of the sludge through the cones.

On Sunday evening our jar tests showed that the higher the pH at the start of the process, the better the process worked, so we installed another pre-dosing pump and increased our soda ash dose by 10 mg/L to 20 mg/L and then adjusted our post-dosing accordingly. We also were experiencing a continual decline in our chlorine residual, and were constantly having to raise our dose rate to compensate for manganese consuming the chlorine. One of the major industries in town uses about 4 ML/day and they experienced problems with their process that they believe was caused by high manganese levels. As a result they had to use different chemicals in their bleaching process.

## 4.0 PUBLIC PERCEPTION

This is an interesting area. We found that the public responded well to the forced restrictions. They did, however, feel that our notification process when we lifted restrictions wasn't handled as well as it could have been. We experienced problems with the logistics involved in mailing out the information. Our contractor acted professionally in meeting our deadlines, but because restriction levels were changing so rapidly, there were often unavoidable conflicts between the written information residents received, and what was being broadcast in the electronic media. The confusion was caused partly by operators notifying management that we could increase the flow through the plant as the turbidity levels decreased, and unavoidable delays in passing this quickly changing information to the public.

The other area of public concern was the water's taste and odour. Unfortunately we were unable to do anything about this. Most of the feedback we received was positive as people could see what was flowing down the river and appreciated having clean disinfected water to use throughout the house, even if it had a smoky taste to it.

## 5.0 CONCLUSION

There is no doubt that all levels throughout the Authority gained a considerable amount of knowledge from the fires and the events that followed. We found that our emergency response procedure worked well, although it needs to be addressed in some areas. One of the main areas of concern was the 24-hour rostering and communication between staff over the first few days. However all involved believed they benefited greatly from the experience, which was highlighted by the teamwork and cooperation between operators and other areas of the Authority. Communication with the public needs to be handled better and this has been looked at by management.

The Wangaratta operators used the experience gained from this event six weeks later

when, on the Easter weekend after more rain, the river turbidity peaked at 2,870 NTU. On Good Friday at around 1,000 NTU the plant experienced the same process problems. The demand at this time wasn't as high, but the storages dropped to a similar level as in March. As we knew what to do, we didn't have the same panic and fuss as previously.

The incident was managed well and the processes followed have been documented for future reference, although we hope we never have to use them again.

## 6.0 ACKNOWLEDGEMENTS

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