Falls Creek Alpine Resort Management Board

2007/08

Falls Creek Alpine Resort Management Board
Water Supply Annual Report

Contents

Legislative Background

Section 26 of the *Safe Drinking Water Act 2003* (SDWA) requires water suppliers and water storage managers to provide to the Secretary of the Department of Human Services an annual report each financial year. This report is for the 2007-08 reporting period and covers issues relating to the quality of drinking water.

The Board's obligations under this Act include:

- A requirement to prepare and implement plans to manage risks in relation to drinking water;
- A requirement to have the risk management plan audited by approved auditors;
- To ensure that the drinking water meets quality standards specified by the regulations;
- To disclose to the public information concerning the quality of drinking water; and
- To report known or suspected contamination of drinking water to the Secretary to the Department of Human Services.

The information to be included in the annual report is specified by Section 15 of the *Safe Drinking Water Regulations 2005* (SDWR) and includes information evidencing compliance or non-compliance (as the case requires) with regulations; viz:

a) information evidencing compliance or non-compliance (as the case requires) with regulations10, 11 and Schedule 2;

b) information about actions taken by the water supplier when a drinking water quality standard set out in regulation 10 and Schedule 2 has not been met;

c) information about actions taken by the water supplier in respect of each emergency, incident or event that has arisen that has affected:
   (i) the quality of drinking water supplied generally; and
   (ii) the quality of drinking water supplied where that supply posed a risk to human health;

d) any issues that may have arisen out of the actions referred to in paragraph (c);

e) an analysis of water sample information, data and results relating to the quality of drinking water supplied and a comparison of that information and data, and those results, with water sample information, data and results from the previous 2 financial years;

f) a summary of every:
   (i) variation in aesthetic standards approved under section 19 of the Act in respect of drinking water supplied by the water supplier and any conditions imposed under section 21 of the Act;
   (ii) exemption from a water quality standard approved under section 20 of the Act in respect of drinking water supplied by the water supplier and any conditions imposed under section 21 of the Act; and
   (iii) written undertaking by the water supplier accepted by the Secretary under section 30 of the Act;

g) a summary of complaints received by the water supplier relating to the quality of drinking water supplied, a summary of the responses and any analysis of the issues arising from the complaints;

h) a summary of the process by which the drinking water supplied by the water supplier is disinfected or treated and any other processes applied to the water by the water supplier, and any issues arising out of the application of those processes;

i) a list of all the chemicals and other substances, and any processes, used by the water supplier to disinfect or treat the drinking water supplied by it;

j) a summary of steps taken by the water supplier to manage the aesthetic characteristics of the drinking water supplied by it, including steps taken to manage the taste, odour, clarity and pH of the drinking water supplied;

k) details of any regulated water supplied by the water supplier and the declaration under section 6 of the Act in respect of that regulated water;

l) details of the steps taken in accordance with section 25 of the Act; and

m) a summary of the findings of the most recent risk management plan audit and any issues that the approved auditor raised during the risk management plan audit.

This report is to be made available to the public on request.

1 Introduction

The Falls Creek Alpine Resort Management Board is responsible for the development and management of the Falls Creek Alpine Resort which is located 120 kilometres south of the Albury/Wodonga area is situated at an altitude of 1210-1830 metres, and bounded on all sides by the Alpine National Park.

The entire resort area of 1535 hectares is Crown land, which is deemed to be permanently reserved under the Crown Land (Reserves) Act 1978. The Resort area is not part of any municipal district for the purposes of the Local Government Act, 1970 and the Board acts on behalf of the Crown under the direction and guidance of the Minister for Environment ("the Minister").

The Board is established by the *Alpine Resorts (Management) Act 1997* which sets out the objectives for the management of Victoria's alpine resorts and provides alignment of the planning and management provisions governing the resorts with the Government's Alpine Resorts 2020 Strategy. Resort use is to be for alpine recreation and tourism, in all seasons of the year; and accessible to persons from varied cultural and economic groups. The management of the resort is to be undertaken in a manner which is compatible with the alpine environment having regard to economic, environmental and cultural considerations.

The Board operates under the business name of Falls Creek Resort Management (FCRM). FCRM provides a range of services to the community and resort visitors determined by clearly defined functions under the Act. These include the provision of a range of utility services in the nature of:

(i) garbage disposal;
(ii) water supply;
(iii) gas;
(iv) drainage;
(v) sewerage;
(vi) electricity;
(vii) roads;
(viii) fire protection;
(ix) snowmaking; and
(x) transport.

FRCM recognises that it has an obligation to provide quality drinking water services for our customers and has in place a risk management framework that sets out the process and approach for the protection of public health by proactively managing water quality from the source through to the customer points of supply.

This report outlines drinking water quality achieved for the 2007-08 financial year and has been prepared to provide our customers with information relating to the quality of water supplied and to comply with the annual reporting requirements under Section 26 of the SDWA. The report covers issues relating to the quality of drinking water and is structured in accordance with the Drinking Water Regulation Guidance Note issued by the Department of Human Services in June 2008.

The report is divided into 11 sections:

1. An overview of the system operated by FCRM.
2. Details of the water treatment and water quality management systems.
3. Quality of drinking water for 2007/08.
4. Emergency and incident management.
5. Complaints relating to water quality
6. Findings of the most recent risk management audit
7. Undertakings under Section 30 of the Act.
8. Exemptions under Section 20 of the Act.
9. Variation in aesthetic standards.
10. Regulated water.
11. Glossary of terms and further information.

For further information, please contact FCRM's General Manager Operations, Chris Derrick on Ph: (03) 5758 1246 during business hours.

1.1 Characterisation of the System

1.1.1 Overview

The drinking water supply system that services the Falls Creek Alpine Resort is comprised of the following elements:

Table 1: Falls Creek Water Supply System Elements

Element	Description	Location and key information about infrastructure
Catchment	Falls Creek Alpine Resort and Alpine National Park	Catchment is upstream of village area with no dwellings.
Storage Reservoir	Rocky Valley Dam	Operated by AGL Hydro
Headworks	Pump Station and Rising Main	Water is pumped from the reservoir through duplicate 150mm diameter rising mains. Pump capacity is 30 L/s.
Distribution System	Settling Tanks, Distribution Main and Brown Tank	Pumped water passed through settling tanks and it is gravity fed by two No. 150mm diameter PVC mains to the service tank (Brown Tank) above the village. From the Brown Tank water is fed by gravity through the UV treatment and into the reticulation system serving the resort.
Treatment System	UV	
Reticulation	Network of pipelines delivering to consumers within the village	Total of almost 4 km reticulation system of predominantly 100mm to 150mm diameter DICL pipe serving: • 120 permanent residents; and • 4700 winter population plus 200 day visitors.

1.1.2 Catchment

The water supply catchment for Falls Creek Alpine Resort is upstream of the township of Falls Creek. Runoff in the catchment is from snow melt and rain runoff which is collected in a series of aqueducts and small mountain streams before flowing into the Rocky Valley Dam which has a full supply capacity of 28,000 megalitres.

Despite the close proximity of the catchment to the town of Falls Creek, there is minimal public access. Only one main road passes through the catchment, which is well vegetated and remains in close to pristine condition. As a result there are no significant point sources of faecal pollution entering the water source – Rocky Valley Dam. There are no intensive livestock operations, dairies, grazing properties, hobby farms, sewage treatment plant discharges, manure spreading applications, aggregations of septic tanks or sewer overflow structures. Recently, access to the catchment to grazing cattle was closed by Parks Victoria, further reducing faecal inputs.

The water source is at no immediate risk of gross contamination with faecal-oral pathogens and there is a need to maintain that position through protecting the source. There is recreational access within the catchment with skiing and related activities in winter and hiking and boating activities in summer. Some water reaching the dam flows through the resort area and may pick up material leaching or being spilt within the resort. Therefore, the source is at some risk from trace levels of contamination from occasional open human defecation, occasional water entry acts by persons, some runoff or exfiltration seepage and some wildlife faecal material. Therefore, like any surface water, there is sufficient risk present to justify disinfecting the source.

The long-term results of raw water monitoring typically show no detectable E. coli in 100 ml samples and what detections there are typically show single digit concentrations per 100 ml. Therefore, the level of risk is adequately mitigated by the current level of disinfection in place involving sedimentation and UV disinfection with the option to draw from one of two quite distinct points in the Rocky Valley Dam source (discussed in more detail later).

It is possible that the levels of activity in and around the dam may increase in future. Planned improvements in treatment automation and reliability should help to offset some of the risks of additional contamination that may arise from these increased activities. However, there is a need for FCRM to work with Parks Victoria and AGL

Hydro to maintain a good understanding of the level of risk associated with this source. At some point it may be judged necessary to introduce an additional treatment barrier beyond the sedimentation tanks and UV systems currently in place. The logical next step would be to introduce a package membrane filtration system or ozone disinfection system if levels of activity on the lake increase beyond low levels.

1.1.3 Headworks System

Water is drawn from the Rocky Valley Dam which is owned and operated by AGL Hydro and principally used for the commercial generation of electricity.

There is an aerator in the dam itself and a compressor line into the dam. The operation of the aeration system is checked daily in winter and in summer on Monday, Wednesday and Friday. The checks confirm that the system is running and has adequate oil. Pump hours are logged. The aerator is important to help reduce the risk of iron or manganese causing problems with UV disinfection system performance or causing problems with aesthetic water quality.

The resort supply is pumped from an offtake point on the dam low level outlet and scour pipe to a pair of settling tanks through 550m of duplicate 150mm diameter PVC rising main. There is a level control pressure switch in the settling tanks which is hard wired back to the control panel in the pump station.

There are three (3) pumps in total, two (2) of which operate on a duty/standby arrangement while the third is a stand-alone backup pump. The pumps deliver approximately 30L/s at 70 metres head.

There is no telemetry at the pumping station requiring that the pumps be inspected daily. Access to the pump station in the winter months is usually by oversnow vehicle.

1.1.4 Distribution System - Settling Tanks, Gravity Main and Brown Tank

The settling tanks (0.6ML – constructed in 2004) are located on the hillside above the dam. After a nominal settling period in the tanks, the water flows for just under 2km by gravity through initially 20m of 300mm diameter DI pipe and then two PVC pipes to the header tank ('Brown Tank' – 1.7 ML). One main is older and is six-inch while the newer main is 150mm Class 18. The water then flows by gravity for 200m to the UV disinfection plant before entering the reticulation that services the village. The capacity of the Brown Tank is about 15% greater than the current maximum daily demand.

A detailed investigation of the village water reticulation network carried out in 2004/05 highlighted that the twin gravity feed trunk mains which convey water from the high level settling tanks to the 'Brown Tank' above the village needed replacement and plans were made to install a single 300mm main in lieu of the old twin mains. Unforseen statutory planning and environmental management issues related to the location of the water main led to long delays in gaining approval to commence work. In 2005 work commenced on the lower part of the main which includes the most technically difficult and expensive section, routed through an alpine bog. The works at this end also included completion of a long planned 'emergency alternative' connection to the Ski Lift Company snowmaking network, allowing this source to be tapped in the event that the FCRM supply is interrupted

Ultimately a section of some 600m of a total project length of 1980 metres was completed, along with the commissioning of the snow making connection.

The tanks are inspected regularly but there is no telemetry at either the settling tanks or the Brown Tank.

1.1.5 Reticulation System

The majority of the 3.86km reticulation system is constructed from rubber ring jointed cement lined ductile iron pipe (DICL), 5.5m in length, and installed progressively since 1988. "Bare" DN100 DICL pipes have been installed every year to replace earlier uPVC and Asbestos Cement (AC) pipes.

There is only one AC pipeline remaining, which is still in use. The remaining uPVC pipes that are still in service are located between the Snow Ski Apartments and the top of Falls Creek Road, and from the Waste Water Treatment Plant to Bogong High Plains Road.

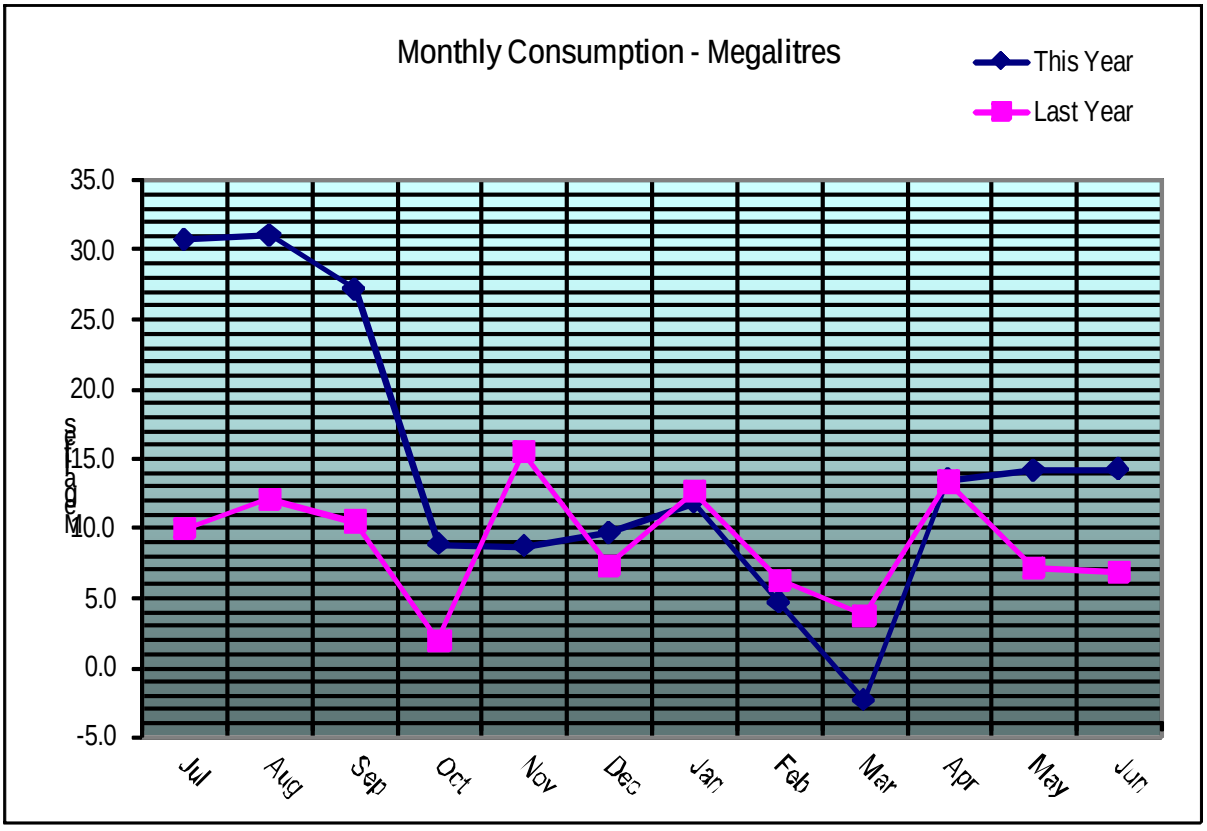
Because of the limited space in many instances most of the utility services have been laid in a common trench.

1.2 Consumption

Output through the system varies with seasonal demand and fluctuates from some 0.2 megalitres per day (ML/d) during summer (population approx. 120) up to 1.5 ML/d during the peak of winter (population approx. 5000). Consumptive use (Total diverted less the amount returned to Rocky Valley Creek) for the last four years is as per Table 2 below.

Table 2: Consumptive Water Usage

Year	Volume Consumed (ML)
2007/08	172
2006/07	107
2005/06	169
2004/05	108



The high consumptive use during the 2007 winter is due to a significant leak on the gravity main about 400 metres from the Brown Tank. Because of the winter snow pack it was not possible to effect repairs until early October.

2 Quality Management System

2.1 Water Treatment

2.1.1 Disinfection Process

Water entering the reticulation from the storage tank is disinfected using UV treatment. The UV disinfection plant installed at Falls Creek is adequate to safely disinfect the raw water under normal circumstances and under higher demand than at present.

The UV unit is a UViFLO 400 (400 kL/h) stainless steel UV disinfection system which includes a single standard 5 kW medium pressure WEDECO lamp. The unit is the 'basic' model with analogue UV intensity sensor and no automated cleaning. Because E. coli has a similar sensitivity to protozoan parasites, and because the unit is a medium pressure unit which is much more effective on viruses than low pressure units, the unit is sufficiently effective on all relevant pathogens to treat water from the Rocky Valley Reservoir which is only likely to contain relatively low concentrations of pathogens.

Whilst the manufacturer recommends that lamps are replaced every 6000 hours they are replaced every six months, which is at around 4,380 hours. Lamps may be changed more often than this in practice, e.g. if the lamps appear dirty or if there is any doubt about the lamps.

When power goes off or the UV sensor is below 80% intensity, an alert light flashes on the outside of the building. The functioning of this alert system is effectively verified during lamp warm up periods and during manual power off during maintenance. There is a daily log sheet and daily site attendance for the UV system. Present demand is well below the rated 60 L/s and rarely exceeds 20 L/s.

2.2 Issues

The effectiveness of UV disinfection diminishes with increasing turbidity, colour, iron and organic content in the raw water and at times the water being disinfected by the UV plant is outside the accepted desirable values for reliable performance. There were two (2) samples which produced an *E. coli* reading of one unit in February and April. Section 22 notifications in relation to these samples were sent to the Department of Human Services (DHS) in accordance with the requirements of the Act[1]. Follow up retest samples returned no *E. coli* results.

[1] Refer to Section 4 for further details

3 Drinking Water Quality Standards

The water quality is compliant with Regulations 10 and 11 and Schedule 2 of the regulations. For regulatory compliance, the parameters tested on a weekly basis are *Escherichia coli* and turbidity. Iron at three locations is also tested on a weekly basis and other health and aesthetic characteristics are also tested less frequently throughout the year. *E. coli* and turbidity test results are submitted to DHS monthly throughout the year in accordance with Regulation 13. The following table presents the Schedule 2 reporting summary results.

Falls Creek Schedule 2 Details

Parameter	Sampling Frequency	Water Quality Standard	Results	Outcome
Escherichia coli	Weekly	At least 98% of all samples of drinking water collected in any 12 months period to contain no *Escherichia coli* per 100mL.	98.0% of initial samples. 100.0% following retest sampling.	Compliant
Turbidity	Weekly	95% upper confidence limit of the mean of drinking water samples collected in the preceding 12 months must be less than or equal to 5.0 NTU	1.5 NTU	Compliant

3.1 E. coli

3.1.1 Test Results

Year	Sampling Frequency	No. of samples[2]	No. of non complying samples	Max Result (orgs/100mL)	% Samples with no *E. coli*	Complying
2007-08	Weekly	102[3]	2	1	98.0%	Yes
2006-07	Weekly	104	2	1	98.0%	Yes
2005-06	Weekly	108	0	0	100.0%	Yes
2004-05	Weekly	96	0	0	100.0%	Yes

3.1.2 Actions undertaken in relation to non-compliance

None required.

3.2 Turbidity

3.2.1 Test Results

Year	Sampling Frequency	No. of samples	Max NTU	Min NTU	95% UCL of mean	Complying
2007-08	Weekly	54	3.4	0.2	1.5	Yes
2006-07	Weekly	57	5	0.5	1.7	Yes
2005-06	Weekly	54	31	0.2	2.7	Yes
2004-05	Weekly	49	5.4	0.3	1.6	Yes

[2] Two (2) sampling locations per week.
[3] Samples taken on 11 December 2007 went missing in post too late to arrange retest samples.

3.2.2 Actions undertaken in relation to non-compliance

None required.

3.3 Health Based Characteristics

3.3.1 Test Results

Results for the reporting period and the previous two years are as shown below. The contaminants tested in 2007-08 did not include all parameters tested in previous years. This was the result of an oversight on the sampling products supplied to Falls Creek and has been addressed so all contaminants will be tested again in forthcoming reporting periods.

2007-08

Parameter	Frequency of Sampling	No. of Samples	Units	Mean Value	Maximum test value	Minimum test value	ADG Guideline	Complies (Y/N)
Pesticides	Annual	1	mg/L	NDET	NDET	NDET		YES
Sulphur	Annual	1	mg/L	<1	<1	<1	500	YES

2006-07

Parameter	Frequency of Sampling	No. of Samples	Units	Mean Value	Maximum test value	Minimum test value	ADG Guideline	Complies (Y/N)
Arsenic	Annual	1	mg/L	<0.001	<0.001	<0.001	0.007	YES
Cadmium	Annual	1	mg/L	<0.0002	<0.0002	<0.0002	0.002	YES
Chromium	Annual	1	mg/L	<0.001	<0.001	<0.001	0.05	YES
Copper	Annual	1	mg/L	0.21	0.21	0.21	2	YES
Fluoride	Annual	1	mg/L	<0.05	<0.05	<0.05	1.5	YES
Lead	Annual	1	mg/L	<0.001	<0.001	<0.001	0.01	YES
Manganese	6 Monthly	2	mg/L	0.001	0.001	0.001	0.5	YES
Mercury	Annual	1	mg/L	<0.0001	<0.0001	<0.0001	0.001	YES
Nickel	Annual	1	mg/L	<0.001	<0.001	<0.001	0.02	YES
Pesticides	4 Monthly	3	mg/L	ND	ND	ND		YES
Selenium	Annual	1	mg/L	<0.001	<0.001	<0.001	0.01	YES
Sulphur	6 Monthly	2	mg/L	<1	<1	<1	500	YES

2005-06

Parameter	Frequency of Sampling	No. of Samples	Units	Mean Value	Maximum test value	Minimum test value	ADG Guideline	Complies (Y/N)
Arsenic	Annual	1	mg/L	<0.001	<0.001	<0.001	0.007	YES
Cadmium	Annual	1	mg/L	0.0003	0.0003	0.0003	0.002	YES
Chromium	Annual	1	mg/L	<0.001	<0.001	<0.001	0.05	YES
Copper	Annual	1	mg/L	0.025	0.025	0.025	2	YES
Fluoride	Annual	1	mg/L	<0.05	<0.05	<0.05	1.5	YES
Lead	Annual	1	mg/L	<0.001	<0.001	<0.001	0.01	YES
Manganese	6 Monthly	2	mg/L	0.002	0.002	0.002	0.5	YES
Mercury	Annual	1	mg/L	<0.0001	<0.0001	<0.0001	0.001	YES
Nickel	Annual	1	mg/L	<0.001	<0.001	<0.001	0.02	YES
Pesticides	Annual	1	mg/L	ND	ND	ND		YES
Selenium	Annual	1	mg/L	<0.001	<0.001	<0.001	0.01	YES
Sulphur	6 Monthly	2	mg/L	<1	<1	<1	500	YES

3.3.2 Actions undertaken in relation to non-compliance

None required.

3.4 Aesthetic Parameters

Results for the reporting period and the previous two years are as shown below.

3.4.1 Test Results

2007-08

Parameter	Frequency of Sampling	Number Samples	Units	Mean Value	Maximum test value	Minimum test value	ADG Guideline
pH	6 Monthly	2	units	6.8	7.0	6.5	6.5-8.5
Total Dissolved Solids	6 Monthly	2	mg/L	28.6	30.0	27.1	500
Colour	6 Monthly	2	HU	13.0	14.0	12.0	15
Total Alkalinity	6 Monthly	2	mg/L	9.0	9.0	9.0	N/A
Calcium	Annual	1	mg/L	1.2	1.2	1.2	N/A
Chloride	Annual	1	mg/L	2.0	2.0	2.0	250
Hardness	Annual	1	mg/L	<5	<5	<5	200
Iron	Weekly	52	mg/L	0.17	1.20	0.05	0.3
Magnesium	Annual	1	mg/L	0.3	0.3	0.3	N/A
Potassium	Annual	1	mg/L	0.3	0.3	0.3	N/A
Silica	Annual	1	mg/L	2.6	2.6	2.6	N/A
Sodium	Annual	1	mg/L	0.7	0.7	0.7	180
Zinc	Not Tested	0	mg/L				3

2006-07

Parameter	Frequency of Sampling	Number Samples	Units	Mean Value	Maximum test value	Minimum test value	ADG Guideline
pH	4 Monthly	5	units	6.9	7.1	6.5	6.5-8.5
Total Dissolved Solids	6 Monthly	4	mg/L	21.4	27.1	15.7	500
Colour	4 Monthly	5	HU	9.2	12.0	6.0	15
Total Alkalinity	6 Monthly	2	mg/L	7.0	7.0	7.0	N/A
Calcium	6 Monthly	2	mg/L	1.6	1.6	1.5	N/A
Chloride	6 Monthly	2	mg/L	<1.0	<1.0	<1.0	250
Hardness	6 Monthly	2	mg/L	5.5	6.0	5.0	200
Iron	Weekly	52	mg/L	0.15	0.74	0.05	0.3
Magnesium	6 Monthly	2	mg/L	0.3	0.3	0.3	N/A
Potassium	6 Monthly	2	mg/L	0.3	0.3	0.3	N/A
Silica	6 Monthly	2	mg/L	2.4	2.5	2.5	N/A
Sodium	6 Monthly	2	mg/L	0.7	0.8	0.8	180
Zinc	Annual	1	mg/L	0.01	0.01	0.01	3

2005-06

Parameter	Frequency of Sampling	Number Samples	Units	Mean Value	Maximum test value	Minimum test value	ADG Guideline
pH	4 Monthly	4	units	6.6	7.2	6.2	6.5-8.5
Total Dissolved Solids	6 Monthly	4	mg/L	15.4	17.1	12.9	500
Colour	4 Monthly	4	HU	9.0	10.0	6.0	15
Total Alkalinity	6 Monthly	2	mg/L	6.0	6.0	6.0	N/A
Calcium	6 Monthly	2	mg/L	0.9	0.9	0.9	N/A
Chloride	6 Monthly	2	mg/L	<1.0	<1.0	<1.0	250
Hardness	Annual	1	mg/L	<5	<5	<5	200
Iron	Annual	28	mg/L	1.0	7.5	0.1	0.3
Magnesium	6 Monthly	2	mg/L	0.2	0.2	0.2	N/A
Potassium	6 Monthly	2	mg/L	0.2	0.2	0.2	N/A
Silica	6 Monthly	2	mg/L	1.8	2.0	1.6	N/A
Sodium	6 Monthly	2	mg/L	0.6	0.6	0.6	180
Zinc	Annual	1	mg/L	0.006	0.006	0.006	3

3.4.2 Actions undertaken in relation to non-compliance

Not Applicable.

3.5 Analysis of Results

3.5.1 Overview

In general the quality of the delivered water is very good. Bacteriological testing is compliant and the 95% upper confidence limit of the mean for turbidity of 1.5 NTU is well within the ADWG guideline target of 5.0 NTU. All health based parameters are within the guideline values.

The physical quality of the source water in the dam varies according to the season and may be detrimentally affected by the following factors:

- Low water levels – partially due to relatively low inflows during drought conditions in recent years together with outflows governed by corporate targets for maximising returns from the energy market. Levels in the lake can be drawn down quickly to low levels in peak energy usage periods. This has tended to concentrate sediment loads and made the off take more likely to pick up disturbed water from any turbulence, wind and wave action, etc.
- Thermal inversion effects – periodically the stratified state of the water body effectively "turns over" as temperature variations generate convection-like movements of the warmer mass toward the surface. As the ambient temperature varies with the season, a relatively sudden inversion takes place, stirring up previously settled sediment. Gas generated by decomposition is also released during these events, as well as at other regular times throughout the year.
- Off take Point Location – the current offtake is attached to the scour pipe or 'outlet pipe' from the reservoir – essentially the pipe which feeds water flow back to the creek below the dam. Being at the lowest point within the storage means that settled matter within the dam will accumulate in high concentrations. Without effective flushing and no scope to vary the off take level to yield better quality water from different stratums of the storage means that the water supply is greatly impacted by the regime within the lake. The actual outlet pipe is known to trap a considerable amount of sediment and is rarely flushed out.

3.5.2 Discussion and Trends

E. coli

There have been 12 recorded instances when the indicator organism *E. coli* has been detected in the reticulation system post UV disinfection since August 1993. The maximum recorded was 3 orgs/100mL during the 2003 bushfires. In all other instances the value was 1 org/100mL. The most recent occurrence was on 8th April 2008. In

the last four instances, retesting has been free of *E. coli.* One of the important risks to drinking water safety arises during UV disinfection system down time, whether due to checking, maintenance or repair. This presents two risks. Firstly, if the unit fails in an unplanned way, un-disinfected water will pass by gravity into the reticulation system presenting an increased risk of pathogen transfer. Second, if the unit is off in a planned way, water flow into the reticulation system ceases and the reticulation system starts to drain, leading to possible risk of reduced pressure in the reticulation system. As part of the continuous improvements to the supply a second parallel UV disinfection system is being sourced. Once a parallel second unit is in place, it will be possible to simply switch to the standby disinfection unit when the duty unit is off line.

Turbidity

The sedimentation basins are effective in reducing turbidity levels of the raw water from the dam before UV treatment. During the reporting period the turbidity range was 0.2 to 3.4 NTU and the 95% upper confidence limit of the mean of 1.5 NTU is well below the ADWG guideline value of 5.0 NTU and was also slightly lower than in 2006/07. Since the commencement of weekly turbidity and bacteriological testing in August 2004, 36 of 218 or less than 17% of samples have produced a turbidity reading higher than 2.0 NTU.

Health Parameters

All health based parameters are well within the guideline values and there is no trend evident with these.

Aesthetics

The water quality test results show that the source water supply suffers from dirty water problems in late summer. This is due primarily to higher than normal iron levels which causes a characteristic brown tinge to the water. The presence of iron particles causes visible 'cloudiness' which is also measured as turbidity. Colour levels are generally satisfactory, although these can be adversely affected by elevated iron levels.

The water in Rocky Valley Reservoir turns over seasonally. Turnover is a common phenomenon caused when surface water layers cool causing the surface water to sink and bringing iron and manganese rich water up from the bottom. The bushfires in December 2006 and January 2003 have exacerbated the effects of the lake turnover by increasing these chemical levels in the lake. Immediately after the fires, iron and turbidity levels in the lake were extremely high caused by ash being washed into the reservoir. This influx of material has provided a source for ongoing dirty water events when the reservoir turns over or is mixed by heavy inflows.

Drawing off water from the scour outlet of Rocky Valley Reservoir is also a key contributing cause of the aesthetic water quality problem at Falls Creek as the iron levels are at much higher concentrations than at the surface or upper reaches of the lake. During the most recent turnover event, measurements of iron concentrations taken at other locations at the surface were one-third of the offtake values. However, even some of the surface level values were still higher than desirable values. There is an aerator installed in the reservoir to prevent stratification and consequent elevation of the iron and manganese levels. However, the benefit from aeration cannot be fully derived given the position of the offtake on the scour.

The effects of the lake turnover during the reporting period are discussed in more detail in section 4.2.

Summary

In summary, the bacteriological water quality delivered to customers continues to be safe, largely due to the fact that under most circumstances the raw water is of high bacteriological quality and the UV plant has a capacity for significantly higher demand. The long-term results of raw water monitoring typically show no detectable *E. coli* in 100 ml samples and the current level of risk appears to be adequately mitigated by the treatment processes in place involving sedimentation and UV disinfection. UV treatment has been effective since the new plant was installed in 1997.

From time to time the water quality delivered is outside of the ADWG guidelines in relation to iron content and whilst the turbidity levels are fully compliant there are times when higher than desirable levels are experienced for efficient UV disinfection. The ability to take supply from the snowmaking system is a demonstrated risk mitigation measure during lake turnover events and there is an opportunity to improve the effectiveness of this measure through improved monitoring and responsive operational behaviour.

To achieve reliable disinfection the ADWG suggest a desirable turbidity of less than 1.0 NTU which is often exceeded. These factors together with taste and odour problems associated with the iron content indicates that in the longer term an alternative offtake and possibly additional treatment is required to ensure a safe, palatable supply to consumers. This is also under review.

4 Emergency/Incident Management

Although preventive strategies are intended to prevent incidents and emergency situations from occurring, some events cannot be anticipated or controlled, or have such a low probability of occurring that providing preventive measures would be too costly. For such incidents, there must be the ability to respond promptly, constructively and efficiently.

There are a number of hazards or events that can lead to emergency situations, including:

- Failing to meet guideline values and other requirements;
- Accidents that increase levels of contaminants (e.g. spills in catchments, incorrect dosing of chemicals);
- Equipment breakdown and mechanical failure;
- Prolonged power outages;
- Extreme weather events (e.g. flash flooding, cyclones);
- Natural disasters (e.g. fire, earthquakes, lightning damage to electrical equipment); and
- Human actions (e.g. serious error, sabotage, strikes).

FCRM has an Emergency Management Plan under the *Emergency Management Act 1986* and this plan is regularly updated and audited.

4.1 Section 22 Reports

The presence of *E. coli* in two samples has been mentioned earlier in Section 3.5.2. Section 22 reports were prepared and sent and the Department of Human Services was contacted immediately in accordance with the Incident Reporting Guidelines. The response was in accordance with DHS directions and both cases were treated as isolated incidents and/or possible sampling error which were later confirmed as safe with further testing. The operational response involved immediate mains flushing, cleaning and replacement of the UV globe and thimble, and retesting. No boil water notices were issued.

4.2 Lake Turnover

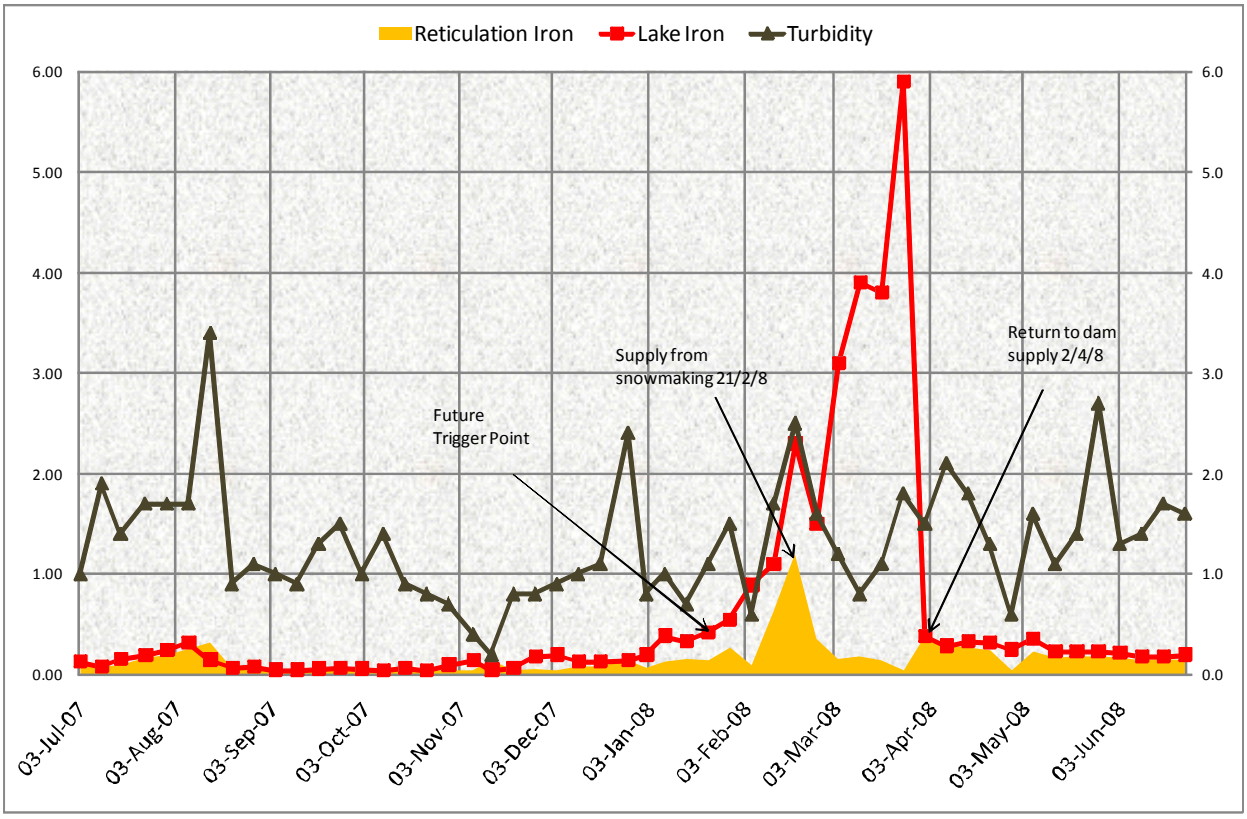
Since the 2006 bushfires the impact of the lake turnover on the water quality has been dramatic. During the most recent lake turnover event February 2008, measurements of iron levels in the lake water were almost twenty times (5.9 mg/L) greater than guideline values and almost 35% higher than the 2007 maximum. Options to relocate the offtake and to provide further treatment of the water are being explored. As an alternative improvement in the short term, a connection to the snowmaking system which draws water from the upper reaches of the lake and which has a filtration system has been installed. This enables filtered water to be pumped directly into the storage tank when iron levels in the lake are high.

Experience from 2007 and 2008 shows that the timing of the changeover to the snowmaking system is critical and in hindsight needs to be triggered earlier. Good records are kept of water quality data. The data are reviewed regularly and trends for determinants such as iron and turbidity can be monitored. Water sources can be switched over to the snow making water source if the trend shows a rise in turbidity or iron prior to concentrations reaching aesthetically problematic levels or affecting the UV disinfection system. Currently judgement is used to make decisions about results, e.g. when to switch to the use of the snow-making water as the source.

An opportunity for improvement identified from the recent audit would be to set pre-defined alert triggers in January for key parameters such as iron and turbidity based on an objective review of historical trends. These triggers could have early warning alert levels, triggering increased attention and possibly more frequent sampling, as well as critical limit values leading to source-switching or other responses. The actual response last year and the potential for improved intervention is described by reference to the graph below.

The decision to change across to the snowmaking supply was taken in late January 2008 when iron levels in the lake were already well on the rise. Unfortunately, due to maintenance programming requirements of the lift company, supply was not able to be established until 21 February and by this stage the levels in the reticulation had already risen above 1 mg/L. As the graph shows, the improvement effect was almost immediate once the snowmaking water was introduced, with a rapid decrease in the reticulation levels the week thereafter even

though levels in the lake continued to rise to an eventual peak of 5.9 mg/L on 25 March. Intervention three weeks earlier would have prevented the build up in the reticulation in the middle of February. A similar pattern occurred in 2007, but monitoring of the lake iron levels was not being undertaken at that time. The rapid increase in the lake is now known to be in late January to early February and the early indications of the turnover event would appear to be successive weekly samples above 0.3 mg/L. This condition will be the basis for action in 2009.



5 Complaints

A summary of complaints received relating to the quality of drinking water supplied is as follows:

Type of Complaint	Number of Complaints	Number of Complainants per 100 Customers Supplied.
Discoloured water	3	3
Tastes & odours	3	3
Blue water	0	0
Air in water	0	0
Illness	0	0
Other	1	1

There were a number of complaints received in February when the quality problems in the lake were experienced. Regular bulletins were disseminated during this event to keep users and stakeholders informed of the nature of the problem and actions being taken to deal with it.

A complaint of hot water filter blockages at a commercial lodge was received and investigated in July 2007. After discussions with the owner several samples were taken for biological investigation. The main finding was that the sample blocking the filter was made up of a large population of zooplankton, dominated by a copepod (*Boeckella*) and a rotifer (*Keratella*). These microscopic animals occur commonly throughout Australia and their numbers rise in the presence of food in the form of algae.

These animals are minute to microscopic and are harmless to humans.

Further testing to determine the extent of zooplankton throughout the reticulation system was carried out. The results showed diverse zooplankton present in differing numbers. Of the commonly seen zooplankton, the largest in terms of size was *Boeckella* which was 1.25mm. The hot water service blockage problem was resolved with the installation of in-line filters on the service line.

6 Risk Management Plan Audit

The Safe Drinking Water Act 2003 requires water suppliers and water storage managers to prepare, implement and review risk management plans for their supply of drinking water and regulated water. Under section 11 of the Act, the Secretary to the Department of Human Services, or their delegate, is empowered to request that a water supplier or water storage manager have their risk management plan audited.

FCRM was informed that its risk management plan was to be audited during the 2007/08 financial year, but for various reasons the audit deadline was deferred until the end of August 2008. While the findings of the audit will be reported in the 2008-09 Annual Report we are able to confirm that the Falls Creek water supply successfully complied with the obligations under Section 7(1) of the Safe Water Drinking Act 2003 during the audit period.

7 Undertakings under Section 30 of the Act

There are no contraventions of the Act that require action.

8 Exemptions under section 20 of the Act

No exemptions were in place during the 2007/08 reporting period.

9 Variation in aesthetic standards

No variations were in place during the 2007/08 reporting period.

10 Regulated Water

FCRM does not manage any regulated water supplies.

11 Glossary of Terms and Further Information

Act	See SDWA
ADWG	Australian Drinking Water Guidelines 2004
AWA	Australian Water Association
Class A water	Recycled water that has been treated to a standard that enables unrestricted public use
CMA	Catchment Management Authority
DHS	Department of Human Services
DSE	Department of Sustainability and Environment
DWQMS	Drinking Water Quality Management System
E. coli	Escherichia coli – organism that indicates faecal contamination. Used as an indicator of safe drinking water
EMP	Emergency Management Plan
EPA	Environment Protection Authority
FCRM	Falls Creek Resort Management
kL	Kilolitre – 1,000 litres
ML	Megalitre – 1,000,000 litres
MOU	Memorandum of Understanding
NTU	Nephelometric Turbidity Units (see Turbidity)
OHS	Occupational Health and Safety
pH	Measure of the acidity or basicity of water e.g.: pH = 7 is neutral; pH < 7 is acidic; pH > 7 is basic
Potable	Drinkable, suitable for human consumption
Regulations	Safe Drinking Water Regulations 2005
SDWA	Safe Drinking Water Act 2003
Turbidity	A measure of the muddiness of water which may be caused by suspended fine clay particles, silts, algae, organic plant and animal debris
UV	Ultra Violet