

# 2009/2010 Annual Report to Department of Health

Melbourne Water

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# 1. Introduction

This report is provided by Melbourne Water to the Secretary of the Department of Health (DH) in accordance with Section 26 of the *Safe Drinking Water Act 2003* for the financial year 2009-2010.

Melbourne Water manages Melbourne's water supply catchments, treats and supplies drinking and recycled water, removes and treats most of Melbourne's sewage, and manages waterways and major drainage systems in the Port Phillip and Westernport region.

Our key stakeholders are customers, government, regulators, other water businesses, land developers, the community and suppliers. These stakeholders and our other strategic partners, including alliance colleagues and research organisations, help us achieve our objectives. We consider social, environmental and financial effects and short-term and long-term implications in all our business decisions.

We are owned by the Victorian Government, with an independent Board of Directors responsible for governance. The responsible Minister is the Minister for Water.

EPA Victoria and the Department of Health regulate the environmental and public health aspects of our business. The Essential Services Commission regulates prices and monitors service performance. We work across several arms of the Victorian Government, including the Department of Sustainability and Environment, and the Department of Treasury and Finance.

Our customers include the metropolitan retail businesses (City West Water, South East Water and Yarra Valley Water), regional water business (Gippsland Water, Southern Rural Water and Western Water), local councils, land developers and businesses that divert river water.

Melbourne Water is committed to providing high quality and reliable drinking water that meets or exceeds regulatory and customer service standards.

## 1.1 Characterisation Of The System

Melbourne Water manages the harvesting of water from catchments, the major transfer, storage and treatment of water, and the delivery of treated water to numerous interface points with the retail water companies. Melbourne Water supplied 361 GL of bulk water to the retail water companies during 2009-2010.

### 1.1.1 Source Of Water

The majority of Melbourne's water is supplied via Silvan Reservoir which receives inflows from Thomson Reservoir, Upper Yarra Reservoir, O'Shannassy Reservoir and other small Yarra River tributaries. Cardinia and Greenvale Reservoirs are supplied by the Silvan system. These sources are supplied to the retail water companies unfiltered because of the high quality of water from the catchments and large storages.

Yan Yean Reservoir and the Healesville supply receive water from protected catchments but are filtered to reduce colour and turbidity.

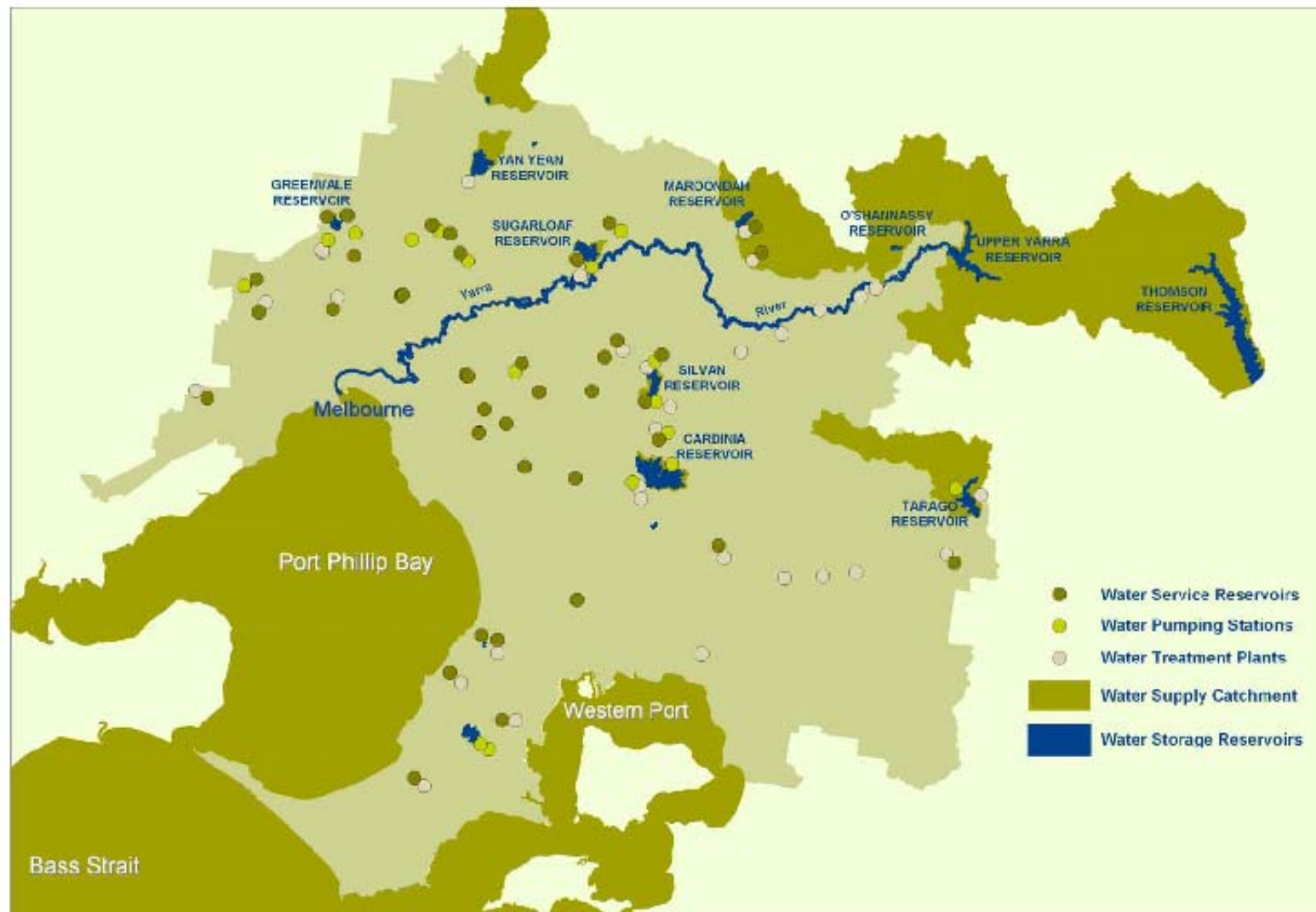
In contrast, water from Sugarloaf Reservoir is derived from a combination of the unprotected Yarra and Goulburn River catchments, and protected catchment water from Maroondah Reservoir, and therefore requires filtration at Winneke water treatment plant. The Goulburn River was a new source of water for Melbourne, introduced for the first time in 2010 as a key element in ensuring sufficient water supplies for Melbourne during the continuing drought.

The Tarago Reservoir catchment is also an unprotected water supply catchment with farming and other activities occurring within the catchment area. Water from Tarago Reservoir is filtered at the Tarago water treatment plant and is also supplied to Gippsland Water as raw water where it is filtered by their treatment processes.

The Yarra Glen system also receives water from a protected catchment but is transferred via an aqueduct with a significant risk of contamination from adjacent rural properties. Therefore the raw water is not considered to be from a protected source and is filtered at the water treatment plant.

Figure 1.1 shows Melbourne Water's Supply Area.

Figure 1.1 Melbourne Water's Supply Area



## 2. Water Treatment and Quality Management Systems

Melbourne Water and the retail water companies have developed risk management systems for drinking water quality using the principles of HACCP (Hazard Analysis Critical Control Point) and the quality management system standard ISO9001. HACCP systematically analyses hazards and establishes measures for their control in order to ensure product safety.

### 2.1 Water Treatment

Melbourne Water supplies water to its retail water company customers that is treated and fit for drinking with the exception of:

1. Gippsland Water which receives raw, untreated water from Melbourne Water's Tarago source
2. 'Supply by Agreement' customers directly connected to Melbourne Water assets. The Melbourne retail water companies have processes to ensure that these customers are informed that their water is not fit for drinking.

Disinfection of source water supplied from open storages is carried out when this water initially enters the distribution system, along with fluoridation and pH correction of the major supplies. At locations where source water comes from unprotected catchments or sources that have little detention time, filtration plants treat this source to maintain quality. Secondary disinfection and secondary pH correction are applied to specific zones (usually remote from the initial treatment).

Long detention time in storages and primary disinfection plants help to inactivate microorganisms (pathogenic bacteria, protozoa and viruses) in the raw water. These disinfection plants also provide, to some extent, control of biofilm growth downstream. The purpose of secondary disinfection is to prevent taste and odour problems and to control biofilm growth within the closed distribution system where the water has already been treated by primary disinfection. Chlorine residual limits are also set to ensure that disinfection by-products do not exceed safe limits.

Chlorination, chloramination and ultra violet (UV) irradiation are the methods of disinfection used by Melbourne Water. Melbourne Water operates six UV irradiation disinfection plants. Ultra violet irradiation works best in cold, very clear water, which

will reach the customer quickly. It provides effective initial disinfection but does not provide a disinfection residual for protection against biofilm growth downstream. At Warburton (Martyr Road), Yarra Junction, Woori Yallock (Lusatia Park Rd) and East Warburton (Brahams Road and Lyrebird Avenue), UV plants provide primary disinfection and sodium hypochlorite dosing plants provide a disinfection residual to control biofilm growth. Note that secondary chlorination by sodium hypochlorite at East Warburton (Lyrebird Ave) commenced in May 2010. At the Tarago water treatment plant, UV irradiation is used as an additional barrier downstream of filtration to ensure protozoa inactivation.

Melbourne Water operates two large filtration plants. Winneke water treatment plant is a sand filtration plant that treats water on the outlet of the Sugarloaf Reservoir. The Winneke water treatment plant incorporates processes including coagulation, clarification, filtration and chemical dosing for fluoridation, chlorination and pH correction. The Tarago water treatment plant at Drouin West commenced the supply of water in June 2009. The plant is gravity fed from Tarago Reservoir and incorporates processes including Powder Activated Carbon and Permanganate pre-dosing, coagulation, Dissolved Air Flotation and Filtration (DAFF), ultraviolet (UV) irradiation for protozoa removal and chemical dosing for fluoridation, chlorination and pH correction.

The Yan Yean water treatment plant is privately owned and operated by United Utilities and supplies treated water into the water supply system under direction from Melbourne Water. Note that this plant is rarely used to supply Melbourne due to low inflows to the Yan Yean Reservoir and subsequent storage levels. It was last used for one month in November/December 2009.

The three small membrane filtration plants at Healesville (Frogley, Cresswell) and Yarra Glen remove particles in the raw water from their respective aqueduct sources. This ensures that parameters such as turbidity and colour are reduced to acceptable levels, particularly during storm events. In addition, pathogens attached to particles are removed. Reducing the turbidity to below 1 NTU also ensures more effective disinfection of the filtered water.

Nine fluoridation plants are operated on behalf of the Department of Health (DH) to protect the dental health of the people of Melbourne. The operation of the fluoridation plants is a statutory requirement under the *Health (Fluoridation) Act 1973*. Three fluoride slurry plants operate at Silvan. One fluoride solution plant doses water at

Monbulk. Four fluorosilicic acid plants dose water; two at Cardinia, one at Winneke and one located at Tarago. The plant located at Yan Yean uses fluorosilicic acid and is operated by United Utilities.

The disinfection process for the water supply system to the towns of Seville and Wandin was changed from chloramination to chlorination on 16 September 2009 to improve the taste of the water and to more efficiently utilise the Silvan disinfection plants to supply these towns. Changing from chloramination to chlorination required careful planning by Melbourne Water to ensure the risk of taste and odour complaints during the days following the changeover was kept to a minimum. At the same time, a new secondary treatment plant was commissioned at Lewis Hill tank to ensure an adequate chlorine residual was present at the outlet of the tank. The shift to water supplied from the Silvan water treatment plant also means that the Seville and Wandin townships are now supplied with fluoridated water.

Table 2.1 describes the water treatment processes and associated chemicals.

## Table 2.1 Water Treatment Process

Water Supply System	Source Water / Catchment	Storage	Treatment Process	Added Substances	Area Supplied <i>(Retail Water Company Supplied)</i>
Cardinia	Transfer from Silvan Reservoir without being treated at Silvan	Cardinia Reservoir	Chlorination (disinfection)	Chlorine gas	Mornington Peninsula and south eastern suburbs <i>(South East Water, Yarra Valley Water)</i>
			Fluoridation	Fluorosilicic acid	
			pH correction	Lime	
			Secondary chlorination	Chlorine gas or sodium hypochlorite	
			Secondary pH correction	Carbon dioxide	
Greenvale	Transfer from Silvan Reservoir following treatment process at Silvan or from Winneke Treatment plant – See Silvan and Winneke water supply systems	Greenvale Reservoir	Chlorination (disinfection)	Chlorine gas	Western suburbs and Sunbury/Melton <i>(City West Water, Yarra Valley Water, Western Water)</i>
			Secondary chlorination	Sodium hypochlorite	
Lower Yarra Valley Townships	Maroondah Catchment	Maroondah Reservoir	Membrane filtration	Hydrex 4709 (membrane cleaning) Aluminium chlorhydrate (ACH) (coagulation)	Yarra Glen <i>(Yarra Valley Water)</i>
			pH correction	Caustic soda	
			Chlorination (disinfection)	Sodium hypochlorite	

## Table 2.1 Water Treatment Process

Water Supply System	Source Water / Catchment	Storage	Treatment Process	Added Substances	Area Supplied <i>(Retail Water Company Supplied)</i>
Lower Yarra Valley Townships	Coranderrk and Graceburn Catchments		Membrane filtration	Hydrex 4709 (membrane cleaning) Aluminium chlorhydrate (ACH) (coagulation)	Healesville <i>(Yarra Valley Water)</i>
			pH correction	Soda ash	
			Chlorination (disinfection)	Sodium hypochlorite	
Silvan	Thomson Catchment Upper Yarra Catchment O'Shannassy Catchment Armstrong Catchment McMahons Catchment Starvation Catchment Coranderrk Catchment	Silvan Reservoir	Chlorination (disinfection)	Chlorine gas	Eastern, central, northern and western suburbs, including Seville and Wandin <i>(City West Water, South East Water, Yarra Valley Water)</i>
			Fluoridation	Sodium fluorosilicate	
			pH correction	Lime	
			Secondary chlorination	Sodium hypochlorite	
Silvan Area	Thomson Catchment Upper Yarra Catchment O'Shannassy Catchment Armstrong Catchment McMahons Catchment Starvation Catchment Coranderrk Catchment	Silvan Reservoir	Chloramination (disinfection)	Chlorine gas Ammonia	Monbulk, Silvan, Kallista, Sherbrooke, Sassafras, Ferny Creek, Olinda, Mount Dandenong <i>(Yarra Valley Water)</i>
			Fluoridation	Sodium fluorosilicate	
			pH correction	Lime	
			Chloramination (disinfection)	Chlorine gas Ammonia	Emerald, Menzies Creek, Cockatoo <i>(Yarra Valley Water)</i>
			pH correction	Caustic soda	

## Table 2.1 Water Treatment Process

Water Supply System	Source Water / Catchment	Storage	Treatment Process	Added Substances	Area Supplied <i>(Retail Water Company Supplied)</i>
Tarago	Tarago Catchment	Tarago Reservoir	Reservoir aeration		Neerim South, Drouin/Warragul <i>(Gippsland Water)</i>
			Reservoir aeration		Morrington Peninsula, West Gippsland townships, southern suburbs <i>(South East Water)</i>
			Odour removal	Powder activated carbon (PAC)	
			Iron/manganese removal	Potassium permanganate	
			Coagulation	Lime Carbon dioxide gas Alum (coagulant) Polyelectrolyte (coagulant aid)	
			Dissolved air flotation filtration (DAFF)		
			UV irradiation		
			pH correction	Lime Carbon dioxide gas	
			Fluoridation	Fluorosilicic acid	
			Chlorination (disinfection)	Chlorine gas	

## Table 2.1 Water Treatment Process

Water Supply System	Source Water / Catchment	Storage	Treatment Process	Added Substances	Area Supplied <i>(Retail Water Company Supplied)</i>
Upper Yarra Valley Townships	Thomson Catchment Upper Yarra Catchment		Reservoir aeration		Woori Yallock, Launching Place, Yarra Junction, Warburton, East Warburton <i>(Yarra Valley Water)</i>
			UV irradiation and secondary chlorination (disinfection)	Sodium hypochlorite	
Winneke	Transfer from Maroondah Reservoir Yarra River Goulburn River	Sugarloaf Reservoir	Reservoir aeration		Northern, eastern, central and western suburbs <i>(City West Water, South East Water, Yarra Valley Water)</i>
			Clarification/filtration	Polyelectrolyte (filter aid) Alum (coagulation)	
			Chlorination (disinfection)	Chlorine gas	
			Fluoridation	Fluorosilicic acid	
			pH correction	Lime	
			Secondary chlorination	Sodium hypochlorite	
Yan Yean	Wallaby Creek Catchment Toorourrong Catchment Yan Yean Catchment Transfer from Silvan Reservoir	Yan Yean Reservoir	Reservoir aeration		Northern suburbs <i>(Yarra Valley Water)</i>
			Filtration	Polyelectrolyte (filter aid) Alum (coagulation)	
			Chlorination (disinfection)	Chlorine gas	
			Fluoridation	Fluorosilicic acid	
			pH correction	Lime	
			Secondary chlorination	Sodium hypochlorite	

## 2.2 Issues

Refer to Section 3 - Emergency/Incident Management for details of three incidents which were reported to the Department of Health in accordance with Section 22 of the Safe Drinking Water Act. There are no further drinking water quality issues of significance to report.

## 2.3 Improvements

### 2.3.1 Operator Training

Melbourne Water's 'Skills Matrix' system for water supply operators was modified to align with the National Water Training Package (NWP07) and the Department of Health's *Victorian framework for water treatment operator competencies* best practice guidelines. The guidelines define the minimum training and qualification standards that operators must attain in order to operate drinking water treatment facilities in Victoria. Recognised Prior Learning (RPL) assessments were conducted for water supply operators against the NWP07 criteria for Certificate III in water operations and almost all operators have achieved certification.

### 2.3.2 Winneke Maximisation

A new pumping station was constructed at Preston to enable Melbourne Water to maximise the supply of water from Winneke water treatment plant and the Goulburn River to Melbourne. Operation of the pump station involves reversing the traditional direction of water flow that normally travels to Melbourne from the Silvan Reservoir in the east.

The Winneke water treatment plant, upgraded in 2009/10 to improve reliability and production rate, is now fully operational and delivering increased water flows. The increased flows necessitated flushing of the water main from Winneke to Preston to remove the build up of material in the pipe prior to the higher flows. Material such as manganese and sediment can deposit on the inside of the water mains and cause dirty water if allowed to build up and be stripped off at high flows.

Melbourne Water worked with the Retail Water Companies to manage the change and the risks to customers. Following operation of the pump station, water quality has remained at a very high standard with no customer complaints associated with the changed source of water. Water hammer associated with the pump operation has been

controlled with new surge mitigation facilities and the setup of Yarra Valley Water's distribution system.

### 2.3.3 Treatment Plant Reporting

Melbourne Water has introduced an additional reporting process for internal reporting of water quality parameters at treatment plants. The reporting criterion is designed to identify when parameters deviate from their normal target range and promptly communicate this information to relevant stakeholders. The reports provide early notification of potential treatment plant process issues, enable improved long term trending of plant faults and facilitate the determination of root causes and preventive actions.

## 3. Emergency / Incident Management

### 3.1 Incidents Reported Under Section 22 Of The Act

#### 3.1.1 *Escherichia coli* (*E.coli*) Detection

On 11 November 2009, there were four *E.coli* detected in a 100mL sample taken from the Harris Gully Main (HGM) at the Craig Road offtake. In accordance with the *Safe Drinking Water Act 2003*, Melbourne Water submitted a Section 22 report to the Department of Health on 12 November 2009. Re-sampling of HGM sites and Mitcham Reservoir outlets and re-testing of the original sample was initiated. All other samples taken from the main on this day had no *E.coli* detected in them. The main and air balls were inspected and found to be intact, with no signs of potential contamination observed. Flows and chlorine residuals at Mitcham inlet were examined and the sampler reported nothing unusual with the sample point. Results of re-samples taken at sites along the HGM all came back with no *E.coli* detected in them. There is a chlorinator operating with a drip feed of hypochlorite into the Mitcham reservoir near the inlets, which would have added some further chlorination to the water in the reservoir.

#### 3.1.2 *Escherichia coli* (*E.coli*) Detection

On 7 December 2009, during a planned replacement of the PLC at the Greenvale pump station, the chlorinator failed to dose for approximately 1 hour and 20 minutes when the pumps began to operate. One *E.coli* was detected in a 100mL sample taken at the Greenvale Yuroke detention point during the disinfection failure event at the chlorination plant. Samples were taken along the main, with the location of the undisinfecting water being monitored and the water scoured to waste. The site and other relevant sites were

re-sampled with no *E.coli* being detected in any of the samples. Melbourne Water submitted a Section 22 report to the Department of Health on 8 December 2009.

### 3.1.3 Fluoride Dosing At Cardinia Treatment Plant

On 25 June 2010, calibration of the flow meter at the Cardinia water treatment plant resulted in an excess of fluoride being dosed into the supply system. The cause of the excess dosage was a failure to switch to the standby flow meter during calibration, which meant that chemicals (fluoride, lime, chlorine) were added to the water at four times the normal concentration for a short period of time. The treatment plant automatically shut down as designed and sent an alarm when the fluoride concentration reached 1.2 mg/L.

As required under the Act, a Section 22 report was prepared and lodged with the Department of Health. The measured fluoride residual was above 1.5 mg/L for approximately 7 minutes which represents 1 ML of water with fluoride above that concentration. The 7 minutes is a function of the time taken for water to be drawn into the sampler and analysed.

None of the water samples collected from the downstream water supply system after the incident had elevated fluoride concentrations.

Actions as a result of the incident vary from changes to procedures to asset operational modifications. Some procedures will be modified and further training will be carried out accordingly. Modifications to the way electronic data is presented and used for operation of the plant will be made. Also, the maximum pump rate on the fluoride pumps will be limited to match the maximum expected water demand from the Cardinia plant given the current water restrictions.

## 3.2 Disclosure of Off-Line Fluoride Dosing Plant

The fluoridation plant at the Winneke water treatment plant was shut down from 3 August 2009 to 12 November 2009 . This was by prior arrangement with DH and was related to a fluoride storage capacity upgrade as part of the Reliability Upgrade Works at Winneke.

## 4. Findings Of The Most Recent Risk Management Plan Audit

The regulatory audit carried out in August 2009 determined that Melbourne Water has complied with the obligations of Section 8 (1) of the *Safe Drinking Water Act 2003* during the audit period of 1 January to 24 August 2009.

Refer to Appendix 1 – 2009-10 Risk Management Plan Audit Certificate in Section 7.  
Refer to Appendix 2 - Drinking Water Risk Management Plan Audit Findings.

## 5. Exemptions Under Section 8 Of The Act

No Section 8 exemptions were in place during the 2009-10 reporting period.

## 6. Undertakings Under Section 30 Of The Act

No undertakings were entered into during the 2009-10 reporting period.

## 7. Glossary Of Terms And Further Information

Appendix 1: 2009-10 Risk Management Plan Audit Certificate

Appendix 2: Drinking Water Risk Management Plan Audit 1 January - 24 August 2009

Further information related directly to water quality can be obtained from Melbourne Water's Annual Report 2009-10 which is made available on the Melbourne Water website, located at: [www.melbournewater.com.au](http://www.melbournewater.com.au)

# Appendices

## Appendix 1. 2009-10 Risk Management Plan Audit Certificate

**KISS** WATER QUALITY

ABN: 97086400888

### Schedule 1

Regulation 8

Safe Drinking Water Regulations 2005

### RISK MANAGEMENT PLAN AUDIT CERTIFICATE

**Certificate Number:** 28

**Audit period:** 1 January 2009 to 24 August 2009

**To:** *Mr. Erik Ligtermoet,  
Project Manager, Environmental Regulation And Reporting  
Melbourne Water Corporation,  
100 Wellington Pde., East Melbourne, VIC., 3002*

**Australian Business Number (ABN):** 81 945 386 953

I, **Frank Kiss**, after conducting a risk management plan audit of the water supplied by **Melbourne Water Corporation**, am of the opinion that—

**Melbourne Water Corporation** has complied with the obligations imposed by section 8(1) of the **Safe Drinking Water Act 2003** during the audit period.

**Signature of approved auditor:**



**Date:** 28 August 2009

## Appendix 2. Drinking Water Risk Management Plan Audit Findings

Table 3.1 below provides a summary of the observations and opportunities for improvement raised from the regulatory audit carried out in August 2009.

### Table 3.1 – Summary of Continuous Improvement Opportunities

Auditable Element	Legislative Reference	Audit Findings	Melbourne Water's Response	Status
<b>Risk Management Activities</b>				
Implementation and compliance with requirements of the risk management plan	SDWA 7(1)(b) 8(1)(b)	The Tarago HACCP Plan (dated 15/7/09) does not accurately reflect the critical limits entered into SCADA for automatic plant shutdown based on turbidity (CCP3) and chlorine residual (CCP1) levels. Also, excursion limit for fluoride is set in SCADA as greater than 1.1mg/L for >2 minutes, not for >5 minutes as detailed in the HACCP Plan. Additionally, UV which has been identified as a CCP in risk assessment table and the process flowchart, has not been given a CCP number in the Control Response table. The Process Control Response Table must accurately reflect Risk Assessment outcomes and automated process controls must be in line with documented CCP limits.	The Tarago HACCP Plan and SCADA alarms will be reviewed and updated as required.	Complete

**Table 3.1 – Summary of Continuous Improvement Opportunities**

Auditable Element	Legislative Reference	Audit Findings	Melbourne Water's Response	Status
<b>Risk Management Plan (contents)</b>				
Procedures/system for : i. Ensuring amount and purity of treatment chemicals added does not affect quality and ii. Controlling residues / by-products of treatment chemicals added	Regulation 6(1)(e)(i) 6(1)(e)(ii)	Control of chemical receipt at Tarago WTP is not completed as defined in Delivery of Alum, Delivery of Fluorosilicic Acid and Quality Control of Chemical Suppliers procedures. Procedures need to be revised to accurately define alternative control protocols in place at the Tarago Water Treatment Plant.	Procedures will be reviewed and updated to reflect current practices.	Complete
<b>Auditable documents</b>				
Operating manuals, procedures or protocols referenced in the risk management plan or associated documents	Regulation 7(b)	a. It was noted that documentation of the HACCP Team membership needs to be revised to reflect recent changes to personnel and positions involved.	The Drinking Water Quality and Risk Management Plan will be updated as required.	In progress – to be completed by Dec 2010.
		b. 4 Contingency Plans were significantly overdue for review.	Contingency plans will be reviewed and updated.	Complete
		c. Although all process monitoring and testing equipment has been calibrated, preventive maintenance and calibration checking of plant and equipment at the recently commissioned Tarago Water Treatment Plant is yet to be added to the Hansen system.	All instruments and corresponding calibration/maintenance activities have now been added to Hansen.	Complete

**Table 3.1 – Summary of Continuous Improvement Opportunities**

Auditable Element	Legislative Reference	Audit Findings	Melbourne Water's Response	Status
Training and competency manuals relating to responsibilities for managing: i. Risks identified ii. Emergencies / events / incidents that may affect quality of Drinking water (for water suppliers) or Water supplied (for storage managers)	Regulation 7(c)	a. Although awareness levels - as observed during the audit - were good, records of Drinking Water Legislation awareness training were not currently available. [It is noted that planned revision of the Skills Matrix Manual (scheduled roll-out in ~Nov 2009) is to include a MWC specific training module on Drinking Water Legislation].	To be developed in accordance with Department of Health's draft Code of Practice for Water Treatment Plant Operator Competency.	Melbourne Water's Skills Matrix Manual for water treatment operators has been finalised and includes the Drinking Water Legislation module. Training in this module will be undertaken by operators in Oct 2010.
		b. It was noted that some Emergency SOPs and Contingency Plans were enacted over the past 2 years, however, other SOPs and Plans have been identified (and procedures documented) which have not been trialled. It is suggested that the review of Contingency Plans and Emergency SOPs should identify the last use of the procedure(s) and 'mock' scenarios established for planned trials of infrequently used contingency plans / emergency procedures.	Procedures will be checked to determine when last exercised and a program to review the plans will be developed accordingly.	In progress – to be completed by Dec 2010.