WESTERNPORT WATER

WATER QUALITY RISK MANAGEMENT PLAN

DRAFT ONLY

September 2007

CONTENTS

Section 4 Action Items Arising From Hazard Analysis and Risk Assessment

- **Consolidated List of Control Measures Requiring Implementation**
- **Consolidated List of Operational Procedures to be Developed**
- **Consolidated List of Monitoring to be Formalised or Developed**
- **Consolidated List of Corrective Action Procedures to be Developed**
- **Consolidated List of Records to be Developed**
- **Audit and Review to be Developed**

SECTION 5 WQMS Action Plan (October 2007- December 2008)

Appendix 1 Westernport Water, Water Supply System Plan

Appendix 2 Westernport Water, Verification Monitoring Program

Appendix 3 Westernport Water, Water Quality Management System Documents

SECTION 1. GENERAL PRINCIPLES

Background

The Water Industry in Australia has for over 120 years worked to provide water of an acceptable quality to its customers. In so doing, obvious problems have been identified and in solving them water quality maintained and improved.

What is meant by the word quality in the context of potable water? A common definition put forward to describe quality is "fit for purpose" which translated to the water industry is "fit for drinking". Perhaps our customers can guide us here. Whenever a water quality incident arises the first question asked is "Is the water safe to drink?" What do they mean by safe? "Will it make them ill?" The second most common concern for consumers is the aesthetic character of the water; does it taste and smell OK, does it look OK, does it dirty their washing? These consumer expectations define our task. This task is now further defined in legislation in the form of the Victorian Safe Drinking Water Act of 2003 (amended 2005).

The existing water supply systems have served Westernport Water customers well for sometime, however, by investing in an improved knowledge of our systems, training of our staff and moderate capital and operational expenditure Westernport Water can improve water quality and security of supply.

Over the last decade there has been a change in the way in which the production and supply of drinking water has been managed. The traditional approach involved establishing treatment barriers to ensure safety. Associated with this was a reliance on the testing of the final product delivered to the customer. An obvious shortfall in this approach is that should off specification water be detected (often after a 2 day delay in getting results back from a laboratory) it is too late to do anything about it. There is also the recognition that zero *E coli* in a sample of water taken in the distribution system does not mean the water is safe. The traditional approach is now being progressively replaced with a system based on the **recognition of hazards** and the **management of risks** by the application of **control measures**.

Guiding Documents

Two important documents exist to provide guidance in the management of the production of safe drinking water.

The Australian Drinking Water Guidelines (2004)

The latest edition of the **Australian Drinking Water Guidelines** (ADWG) released in 2004 include a new section entitled "Framework for Management of Drinking Water Quality" (The Framework). This represents a departure from previous guidelines where management of drinking water quality was based on monitoring of the final product water quality. Instead, the Framework introduces a risk management

approach to the management of drinking water quality. The fundamentals of this approach include a detailed analysis of water supply systems in which hazards and existing preventive measures are identified and an assessment of the adequacy of those measures is made. Where these are considered inadequate, there is a need to modify existing preventive measures or introduce new ones. The Framework also promotes the identification of control points in the process from catchment to consumer and the establishment of formal control processes for each point.

The ADWG Framework is based on twelve Elements.

1. Commitment to Drinking Water Quality Management.
2. Assessment of the Drinking Water Supply System.
3. Preventive Measures for Drinking Water Management.
4. Operational Procedures and Process Control.
5. Verification of Drinking Water Quality.
6. Management of Incidents and Emergencies.
7. Employee Awareness and Training.
8. Community Involvement and Awareness.
9. Research and Development.
10. Documentation and Reporting.
11. Evaluation and Audit.
12. Review and Continual Improvement.

(Note: Westernport Water has opted to use the term control measure rather than preventive measure. The intent is the same)

Victorian Safe Drinking Water Act 2005

The Victorian State Government passed a **Safe Drinking Water Act** in June 2003. The act was amended in 2005. This act provides details of further requirements for Victorian Water Authorities.

The purpose of the Safe Drinking Water Act (2005) is to make provision for the supply of safe drinking water. In outline this Act:

(a) requires water suppliers and water storage managers to prepare and implement plans to manage risks in relation to drinking water and some types of non-potable water; and
(b) provides for the auditing of those plans by approved auditors; and
(c) requires water suppliers to ensure that the drinking water they supply meets quality standards specified by the regulations; and
(d) requires water suppliers to disclose to the public, information concerning the quality of drinking water; and
(e) provides for the variation, after community consultation, of water quality standards that relate only to aesthetic factors; and
(f) requires the reporting of known or suspected contamination of drinking water to the Secretary to the Department of Human Services; and
(g) empowers the Secretary to enforce this Act.

In particular the Act requires the preparation of Risk Management Plans for each supply system. These must

(a) contain a detailed description of the system of supply

(b) identify the risks to the quality of the water and the risks that may be posed by the quality of the water
(c) assess the risks
(d) set out the steps to be taken to manage those risks (including the development and implementation of preventative strategies)
(e) contain any other matters required by the regulations

The integration of the elements of the ADWG and the requirements of the Safe Drinking Water Act provide a comprehensive program to ensure the supply of high quality, safe water at all times.

Hazards, Hazardous Events and Risks

One of the aims of catchment management, water treatment and distribution system management is to reduce the risk to public health due to hazards in the water collection, treatment and delivery process.

A **hazard** may be thought of as any potential danger to consumers. Hazards associated with water include:

- *Microbiological contamination* (health)
- *Chemical contamination* (health)
- *Physical contamination* (health and aesthetics)

A **hazardous event** is an incident or situation that can contribute to the presence of a hazard. A hazardous event may include, for example

Dosing malfunction at a Water Treatment Plant or disinfection site
A filter failure at a Water Treatment Plant.

The best way to manage an identified hazard or hazardous event would be to **remove** the hazard or **prevent** the hazardous event. If this cannot be done then the best option is to **control** the hazard or hazardous event by **reducing the likelihood** of the event happening, or by **reducing the consequences** if the event does occur.

If a hazard or hazardous event cannot be controlled, then there is a **risk** that the quality of the water delivered to the customer will be adversely affected which in turn may have an adverse impact on health or other human activities.

Microbiological Hazards include disease causing bacteria, viruses, protozoans and parasites, usually of faecal origin.

Chemical Hazards include chemicals

From the catchment

Iron, manganese, pesticides, herbicides, fertilizers, algal poisons, endocrine disrupters, tip leachate, animal manure,

From reservoirs

Plasticisers from liners, equipment lubricants, storm water pollutants

From water treatment

Contaminants in treatment chemicals, DBPs, treatment chemicals

From the distribution system
Copper, zinc, high pH from pipes
Lubricants from equipment valves
Petrol, oils, cleaning agents from maintenance work

Physical Hazards include silt or sediments (whether suspended or re-suspended) turbidity and colour. The sediment may also contain microbiological contaminants and chemical contaminants.

Risk Management Plan

In producing the Risk Management Plan (RMP), a fundamental objective has been to develop a format that is acceptable and readily understood by operational staff. In doing this, jargon has been minimised and documentation designed to be informative and user friendly and limited to what is necessary.

SECTION 2. SPECIFIC ELEMENTS

System Description (ADWG Element 2)

Preparation of the RMP requires the development of a system plan with sufficient detail to assist the identification and estimation of significant risk and the means for control.

Raw Water Supply

Westernport Water has a single water supply and a single water supply system. Water is sourced from the Candowie Reservoir in the Bass Hills near Glen Forbes and treated at the Ian Bartlett Water Purification Plant (IBWPP).

The raw water quality in Candowie Reservoir is typical of water that is sourced from an unprotected catchment with some intensive farming activities and runoff from cleared land within the catchment area. The raw water contains variable levels of nutrients, organics, manganese and iron.

Poor rainfall in recent years and reduced water availability in the Tennant Creek catchment has meant that other sources of water have been utilised. All of these water sources are transferred to Candowie Reservoir for centralised storage and treatment at the IBWPP.

Bass River
A water pumping station was built on the banks of the Bass River during 2006/2007 to transfer water via the 3 km Bass River Pipeline to Candowie Reservoir. The two variable speed, centrifugal pumps began pumping on the 5th of July, 2007 and have been delivering an average of 120 L/s of water to the reservoir. A control system is in place to extract the optimum flow according to the river level and a pump cut off point has been set at an environmental river flow of 46 ML/d.

Lance Creek Reservoir
Westernport Water is able to access water from Lance Creek Reservoir on a share basis with South Gippsland Water Authority. The pump station at Lance Creek Reservoir allows Westernport Water to pump 4 ML/d. Pumping began on the 30th August, 2006 and a total of 520 ML was intermittently pumped to Candowie Reservoir during 2006 and 2007.

Corinella Bores
A number of shallow and deep bores have been drilled at Grantville and Corinella. Continuous pumping at the Grantville bore began on the 9th of April 2007. By the 30th of July 2007, 265 ML had been pumped from this bore to Candowie Reservoir via the Grantville Pipeline (running 5 km from Grantville to the Bass River Pipeline). Pumping from Grantville ceased at the end of July 2007 and the site has been de-commissioned. The site can however be re-activated for emergency drought relief.

Smaller bores at Corinella are listed in Table XX. Deep bores are expected to provide approximately 1 ML/d and the shallow bores are expected to provide approximately 1 to 1.5 ML/d. The Corinella Pipeline is currently being constructed to link the bores in Corinella to the Grantville Pipeline.

Table 2.1 List of bores

Location	Bore Type	Status
King Rd Wastewater Treatment Plant (WWTP)	1 x shallow	Drilled
	1 x deep	Drilled
King Rd 500 m from WWTP	1 x shallow	Drilled
Cnr King Rd and Bass Hwy	1 x shallow	Drilled
Cemetery Rd	1 x shallow	Drilled
King Rd 1 km from WWTP	1 x deep	in process
Corinella Primary School	2 x shallow	Proposed

Water Treatment

The raw water from Candowie Reservoir is treated using a combination of flocculation, coagulation, dissolved air flotation, filtration, and disinfection. The IBWPP is located adjacent to the reservoir. A summary of the processes used is shown in **Table 3.1**.

Table 3.1 Water treatment processes

Locality	Treatment Process	Added Substances	Comments
IBWPP	Oxidation	Potassium Permanganate	Removal of manganese and iron
	Activated Carbon	Powdered Activated Carbon	Control of taste and odour and algal toxins
	Coagulation / flocculation	Aluminium Sulphate	Removal of colour and turbidity
	Dissolved air flotation / filtration	Nil	Removes floc particles
	pH correction	Caustic Soda	Required to raise pH to ~7.4
	Disinfection	Chlorine Gas	Disinfection
Various locations throughout the water supply system	Disinfection	Sodium Hypochlorite	Booster chlorination stations used throughout the water supply system to retain an appropriate chlorine residual

	Ultra Violet Disinfection	Nil	The UV system services a distinct water supply area on Phillip Island

The WTP was automated in 2006 with the installation of a PLC and SCADA control system. The system included

- PLC control of chemical dosing, water quality trending and remote access for improved control at all times.
- Turbidity meters have been installed on all of the individual filters and the combined filter effluent.
- A turbidity meter was also installed at the raw water inlet so that raw water turbidity changes can be detected.
- Variable speed drives were put on two of the low lift pump and this allows the operators the freedom to change the flows to suit supply requirements, water quality and process operation requirements.
- A chlorine residual analyser was installed at the 5 min detention time location in order to detect any chlorination issues quickly. Another chlorine residual analyser was installed at the 30 min detention time location to better monitor the chlorine residual and pH of the water supplied to customers.
- Automatic shut down alarms on the 920 kg drums in case of a chlorine leak and an audible alarm that also pages an operator were also implemented.

Distribution

The treated water is then distributed to communities through a single major supply line with a number of smaller off takes servicing each of the residential communities within Westernport Water's district. Westernport Water services approximately 15,000 properties on Phillip Island and an area of the mainland from The Gurdies to Archies Creek. Individual towns that are provided with potable water include Bass, Grantville, Corinella, Kilcunda, Dalyston, San Remo, Woolamai Waters, Rhyll, Cowes and Ventnor.

A plan of the Westernport Water, disinfection system is included in Appendix 1.

Identification of Control Points (ADWG Element 2)

A **Control Point** can be considered as a step in a process where control can be applied or a hazard prevented, removed or reduced to acceptable levels. An alternative way to consider a control point is that it is a step in a process where if poor process control is practiced the quality of the final product is likely to deteriorate.

For the Westernport Water, water supply system, the following control points have been identified.

- Catchment and Reservoir
- Coagulation and flocculation
- Dissolved Air Flotation
- Powdered Activated Carbon (PAC) dosing
- Potassium Permanganate dosing
- Media filtration
- Disinfection
- Distribution (Including storages and pipes)

Detailed analysis of these control points is provided in Section 3

Risk Assessment (ADWG Element 3)

Many risk assessments identify hazards as the starting point for the risk assessment. Nadenbaum et al 2004 include the identification of hazardous events as well as the identification of hazards. This is particularly relevant to the generation of RMPs for the water industry and these have been included in the methodology applied here.

A fundamental component of a risk assessment is to understand the risk and assign a quantitative value to that risk. Based on this quantitative value, action items can be prioritised for attention based on the residual risk to Westernport Water. The risk is quantified by determining the **consequence** of the outcome of the risk, and the **likelihood** that those consequences may occur.

The procedure adopted by Westernport Water for the preparation of the RMP is described below. It is based on the Westernport Water Procedure for Business Risk Management (Draft July 2006).

1. Identifying the hazard and risk at each control point.
2. Determining the consequence based on the definitions in Table 1.
3. Determining the likelihood based on the definitions in Table 1, taking into consideration the controls in place at the time. Where controls are not consistently applied or effective in reducing the risk, a higher likelihood rating results.
4. Assessing the effectiveness of the controls based on definitions in Table 2.

Table 1 of the Procedure includes consequences that may impact all parts of the business including

- Human OHS
- Infrastructure/Services
- Finance
- Environmental
- Water Quality
- Community

Only the water quality consequences have been reproduced here in Table XX. The original document may be sourced for definitions relating to the other areas of business.

Table XX. Water quality risk assessment table

	CONSEQUENCE	LIKELIHOOD	
Catastrophic	- Health epidemic through water poisoning - E Coli, Cryto & or Giardia detected in samples - Boiled water alert	**Almost Certain**	The event is expected to occur in most circumstances (More than once per year
Major	- Blue green algae alert -Contamination of water in the distribution system - Chronic illness, major health concern related to possible carcinogens	**Likely**	The event will probably occur in most circumstances (Once per year)
Moderate	- Non health related quality complaint - Toxic metals present causing stained laundry, bitter taste & blue/green stains	**Possible**	The event should occur at some time (Once every 5 years)
Minor	-Taste & Odour complaints - Dislodged biofilms resulting in dirty water complaints	**Unlikely**	The event could occur at some time (Once every 10 years)
Insignificant	- Customer complaints drying of the skin, acrid taste.	**Rare**	The event may only occur in exceptional circumstances (Less than once in 30 years)

Table 2. Control Assessment Table

Rating	Description
Strong	The control *environment* is operating effectively, providing a reasonable level of assurance that objectives are being achieved.
Moderate	The control *environment* has some weakness / inefficiencies. Although these are not considered to present a serious risk exposure, improvements are required to provide reasonable assurance that objectives will be achieved
Weak	The control *environment* is not sufficient, as many weaknesses / inefficiencies exist. Reasonable assurance does not exist that objectives will be achieved.

5. Determining the residual risk by reference to Table 3

Table 3. Risk Rating Table *(Revised)*

	CONSEQUENCE				
LIKELIHOOD	Insignificant	Minor	Moderate	Major	Catastrophic
Almost Certain	High	High	Extreme	Extreme	Extreme
Likely	Medium	High	High	Extreme	Extreme
Possible	Low	Medium	Moderate	High	Extreme
Unlikely	Low	Low	Medium	Moderate	High
Rare	Low	Low	Low	Moderate	Moderate

6. Collating all risks in the risk register in order of highest to lowest including a listing of how strong the current controls are.
    a. Any 'Extreme' or 'High' risks are unacceptable and require further treatment to reduce ranking to an acceptable level.
    b. Any risks rated lower than 'High' are considered acceptable and treatment is not required. Executive Management must sign off on acceptable risks and allocate a Risk Owner. There maybe some cases that Executive Management considers a risk unacceptable even though it has a low ranking.

7. Allocating responsibility and a time frame for correction. This is summarised in Table 4.

Table 4. Evaluation and Responsibility

Risk Ranking	Evaluation	Risk Mitigation Timing	Risk Responsibility (Risk Owner)
Extreme	Unacceptable	Cessation until residual risk is reduced to 'High' or lower. *Subject to current controls* *Require treatment/action plan within three (3) weeks or as directed by Executive Management Team (EMT)*	Executive Management
High	Unacceptable, only can be accepted by Executive Management members.	*Subject to current controls* Require treatment - Action plan required within *Three (3) to Six weeks* .	Executive Management
Medium	Acceptable	May require treatment - Action plan required within *Three (3) to Six weeks*	Allocation by Executive Management to Operational Managers who will be responsible for monitoring and reviewing.
Low	Acceptable	May require treatment - Action plan required within one year.	Allocation by Executive Management to Operational Managers who will be responsible for monitoring and reviewing.

Current controls in place that are not rated 'Satisfactory' should also be examined and any suggested improvements to these controls should be suggested as treatment options.

Risk Owners

Risk Owners have the responsibility for identifying when risk ranking has changed and will alert the Risk Manager. Any changes to the assumptions, controls or factors surrounding the risk require a review of the rating by the Risk Owner. Where the Risk Ranking has changed then this should be communicated to the Risk Manager.

The risk ranking determines the minimum regularity of reviewing and updating the risk. Table 5 determines the minimum timing to review the risk analysis to ensure that the ranking has not changed. However, risks should be reviewed whenever any relevant factors that affect the risk have changed regardless of the timing in Table 5.

Risk Monitoring & Recording

WPW uses dedicated data base for recording and monitoring changes of any new/current risks or hazards identified in the business. The IRIS program designed by Periscope Consulting is specialised Risk Management software. This is maintained by the risk manager and any changes in extreme or high risks reported in accordance

with table 5. The software provides an audit history trail of all changes made to a record. This enables the risk manager to evaluate who, when or what may have been changed against a particular record. All tasks assigned to a risk that has been effectively actioned are archived within the system. Changes in a risk category i.e. from high to extreme is monitored and recorded in the top 20. Reports may be selected specifically to business area eg. Water Quality for focus/prioritisation in these sectors.

Risk Owners are to predefine risk performance indicators for each risk. Any incidents resulting from the risk will be notified to the Risk Manager by the Risk Owner. These will be recorded and measured against the performance indicators. Incidents will require the risk to be evaluated against performance indicators and if required will change the risk ranking.

In some cases an Executive Management meeting will be required due to the high nature of a new risk. Such a meeting will be called as required.

Table 5 - Timing for Risk Review

Risk Ranking	Re-assessment of Risk (suggested minimum)
Extreme (Top 20)	Monthly review
High	Bi-annual review
Moderate	Annual review
Low	Annual review
Risk Profile	Audit & review annually

Determination of Target Objectives and Critical Limits (ADWG Element 4)

To be a control point, there must be something that can be measured to allow the operator to know if the process step is "in control" "heading out of control" or "out of control". By setting numerical limits, the operator can make this assessment and take whatever action is necessary to maintain control at the control point.

The ADWG 2004 puts it this way;

"A control point has several requirements including

- Operational parameters that can be measured and for which critical limits can be set to define the operational effectiveness of the activity (e.g. chlorine residuals for disinfection)
- Operational parameters that can be monitored frequently enough to reveal any failures in a timely manner (on line and continuous monitoring is preferable)
- Procedures for corrective action that can be implemented in response to deviation from critical limits."

Two different target levels are often set.

1. **Target criteria**. The target criteria represent the day to day operational limits "Any deviation of performance from the target should be regarded as a trend towards loss of control of the process and should result in appropriate actions being taken to resolve the problem and restore control." How to retain the process within the target limits would normally be described in well written **operational procedures**.

2. **Critical limits**. This is the level that *must not* be exceeded. "Deviation from a critical limit indicates loss of control of the process and should be regarded as representing a potentially unacceptable health risk. Such events should result in immediate notification of the appropriate health regulator."

Target criteria are always more stringent than the critical limits. By setting target criteria that are more stringent than critical limits, **corrective actions** can be taken before an unacceptable health risk occurs (i.e. exceeding the critical limit).

The target objectives and critical limits often serve as a trigger for the initiation of a specific control measure.

Target objectives and critical limits for each of the control points are provided in the control point summary Tables in Section 3.

Monitoring (ADWG Element 4 & 5)

The testing and observations that are made to determine whether the process is achieving the limits defined for that control point is **process monitoring**.

Process monitoring describes the tests and observations taken at a particular control point to determine the compliance or non-compliance with the limits defined for that particular point.

By verifying that *all* the control points in a process are within the recommended range, it ensures that the final product will be within the specific limits. Testing of the final product quality is **verification monitoring** and simply verifies that the total system is working. Process monitoring of control points allows the operator to detect problems *before* they can have an impact on final water quality.

Process monitoring parameters have been determined for each control point. Monitoring frequencies have been determined by considering how rapidly a process monitoring parameter might change and present a risk to the production of safe drinking water. Details of the process monitoring program are provided in the body of the RMP.

Verification monitoring is conducted in accordance with the requirements of the SDWA (2005). A summary of this is provided in Appendix 2.

The sampling program for compliance with SDWA requirements is planned for each financial year.

A summary of the Westernport Water microbiological and chemistry sampling requirements for the period 1st July 2007 till 30th June 2008 can be found in the file

Updated Sites 07_08.xls
at
C:\Deans\File\TEMP\dean\BactoTemplates

Process monitoring is carries out at a number of sites within WPW, principally the WTP and disinfection sites within the Distribution System

Operating Procedures and Corrective Action Procedures (ADWG Element 4)

To avoid confusion when monitoring has identified that an increased risk may be developing, it is important that the response is carried out according to a well prepared **Standard Operating Procedure (SOP)**. These have been identified in the RMPs. In many instances these procedures do not exist in which case they have been identified as requiring development.

Written procedures are not necessary for all control measures. Where an action falls into a normal operator competency for a particular operator type, this has been identified and no formal procedure has or will be prepared. An example is the performance of a draw down test for coagulant carried out by a Water Treatment Plant Operator. This is considered to be a normal operator competency and does not have a supporting operational procedure. In contrast, filter performance assessments are not considered to be part of a normal operator competency and therefore require a formal operations procedure.

Corrective Action Procedures (CAP) describe how to return a control point to full control when monitoring has identified a developing loss of control. These too are under development and where this is the case these are identified in the body of the RMP.

All procedures relating to water quality management are maintained in TRIM container number 518-004 (Technical Operations-Water Quality-Water Quality Management System). The existing procedures are listed in the table below.

Table Summary of Water Quality Management Procedures

TRIM Reference	Title
IN07-05776	Procedure for jar testing
IN07-05775	Procedure for checking filter headloss gauges
IN07-05759	Procedure for detection of E coli
IN07-05758	Disinfection schematic 2007
IN07-05532	Procedure for collecting water quality samples
IN07-05531	Jar test procedure
IN07-05529	Disinfection distribution system
IN07-05528	Safe drinking water act 2003
IN07-05526	Chlorine leak procedure
IN07-05525	Micro and chem. Sampling requirements for 07/08

Records (ADWG Element 10)

Monitoring data needs to be stored to allow generation of information.

Process monitoring data generated at the IBWPP is entered onto daily record sheets. Individual officers have a responsibility to review the data each time new data is added to ensure that the various control points are under control.

Verification monitoring data generated from samples sent to an external consultant laboratory are e mailed to WPW as pdf files. These are currently stored on the hard drive of the WTP computer. At present there is no trending capability. Each result file is reviewed by the WTP operator and any problems identified.

Currently steps are underway to transfer all data to a database system that will allow some trending and higher level interrogation.

Incidents and Emergencies (ADWG Element 6)

An RMP also needs to include reference to the management of incidents and emergencies. Despite best intentions, shortcomings in preventative measures may arise and indeed situations may arise that were not anticipated. A well designed risk management system provides a mechanism to learn from failures of preventative measures to continuously improve the risk management process. Incident and emergency management processes also need to be well defined. To avoid confusion in the face of increasing tension during the development of a water quality incident or full blown emergency, the incident and emergency responses need to be well established and practiced in advance.

An **incident** has been defined for the purposes of water quality management as the failure of any critical control point such that the critical limits have been exceeded. The level of response required depends on the magnitude of the variation and the duration of the variation. An **emergency** has been defined as anything that is notifiable under the Victorian Safe Drinking Water Act 2005 Section 22.

WPW Emergency Management Manual is a business system for managing emergencies inclusive of those relating to water quality. The roles and responsibilities of the Emergency Management Team (EMT) are defined. This is distinctly different from the Crisis Management Team (CMT) which is incumbent with ensuring business continuity in the event of a potential disaster. I.e. extreme risk event. Actions, responses and notification are clearly defined in the Communications Responsibilities table within the EMM and in the Business Continuity Plan (BCP communications strategy). The scale of the event determines whether this is managed with the EMT or via the crisis BCP process.

The WPW BCP specifically addresses events that have the potential to escalate into a crisis or is a notifiable event. The BCP details scenario plans and recovery plans surrounding potential water quality threats. (note this needs to be workshopped) Pete I’ve attached a copy of our BCP including the recovery plan for Water Quality they we need to complete for this process.

Training (ADWG Element 7)

Training and implementation of that training is an essential component of an effective water quality management program. Westernport Water Training and Development Policy is summarised below.

> "Provision of training and development for all employees is a high priority for Westernport Water and is a key to the achievement of the Corporate Strategy. Westernport Water shall provide as much training as possible on site so as to minimise the impacts on employees through traveling.
>
> Westernport Water will annually complete a training needs analysis drawing from the training needs identified for individual employees during the annual Performance Reviews. The Training Need Analysis will also take account of identified corporate initiatives and legislative requirements.
>
> It is the policy of Westernport Water to support and encourage employees undertaking additional formally accredited study outside of the requirements of Westernport Water, provided that the additional study will contribute to the employee's career in Westernport Water and has approval prior to commencement.
>
> Job rotation is regarded a bona fide mechanism to increase the skills and experience of employees. Job rotation will not generally attract a higher duties payment, but should be taken into account in regard to annual performance review.
>
> In the interests of risk management it is the policy of Westernport Water to have at least two people capable of performing each critical function with Westernport Water."

Westernport water policy on Certification Levels for Operators working within the Water Quality Management System is summarised in Table XX

	Certification Level	Additional Specific Training	Desirable
WTP Operators	Certificate 3	Coagulation Flocculation DAF Filtration Chlorine Disinfection Confined Space Entry	WTA filter optimisation IT 1 and 2 Blue Green Algae
Distribution System Operators	Certificate 3	Disinfection Sampling Maths 1	

A summary of the current training status of WPW Water Quality Officers is provided in the Table below

	Dean Chambers	Brett Beaumont	Steve Fisher	Peter Brown	Andrew Dean	Noel	Quentin	Steve Forster	Chris
Certificate 1	y	y	y	y	y			y	y
Certificate 2	y	y	y	y	y	y	y	y	y
Certificate 3	y	y	y	y	y	in progress	in progress	y	y
Maths 1	y		y						
Maths 2	y		y						
Sampling	y		x						
Laboratory Skills	y		Oct-07						
Chlorine Disinfection	y		y						
Water Treatment	y		y						
Coagulation/Flocculation	y		x						
Dissolved Air Flotation	y		Oct-07						
Filtration	x		x						
WTA 1 day seminar	y								
WTA 2 day workshop			y						
UV Disinfection	y		x						
Chloramination	y	y	x						
Fluoridation	y	early 2008	early 2008						
Blue Green Algae	y		x						
Confined Space Entry	y		y	y	y	y	y	y	y
IT 1 (TAFE)	y		x						
IT 2 (TAFE)	y		x						

Audits (ADWG Element 11 & 12)

In addition to the audit of the RMP to be carried out by the Department of Human Services, Westernport Water carries out an annual review of the RMP to ensure that the risk profile is correct and current.

The organisation changes over time therefore so will the risk profile. A review is required to ensure that no new risks have arisen since the last review, and where risks have been identified and analysed, that there have been no changes to their ranking.

At any stage new risks can be identified and reviewed.

The aim is to ensure the hazard analysis and risk rankings are current and that management decisions are based on a current risk profile.

An internal and external audit of the risk management system will be conducted on a biannual basis.(nothing stated in the SDWA re: frequency)These may be in conjunction with our self assessment process driven by the WPW Risk & OHS audit committee. The self assessment and auditing will include but not be limited to sampling & verification aimed at policy and standards compliance.

An audit if the Risk Management Plan may be as a result of:

- Any changes in the business environment that is likely or has the potential to impact on water quality.
- As a result of any deficiencies reported in the system &or processes.

The Risk Management Plan and all files relating to it are stored in TRIM (518-004 Technical-Operations - Water Quality - Water Quality Management System).

While recognising the need for audits of the WQMS and RMP Westernport Water is currently in the implementation phase of the 2007 review of the RMP and as such feel that an audit would simply cover the same ground that the review is covering. As such there will be no audit for 2007, however an internal audit of the RMP and WQMS will be conducted prior to the review of the RMP in November 2008.

Outcomes of any audit process will be stored in the above TRIM folder

Responsibilty for the implementation and tracking of review and audit action items lie with the Risk Manager & General Manager APD&O & progress will be monitored via the Executive Management Team (EMT) and or the internal audit committee.

References

Australian Drinking Water Guidelines. (2004) Framework for the Management of Drinking Water Quality.

Nadenbaum,P. Chapman,M. Mordern,R and Rizak,S. (2004). A guide to hazard identification and risk assessment for drinking water supplies. CRCWQT Research Report 10.

Safe Drinking Water Act Victoria (2003). Act No. 46/2003.

SECTION 3. CONTROL POINT TABLES

Catchment and Reservoir
Control Point Summary

Control Point	Catchment/ Reservoir		
Purpose	To collect rain water and store it for later treatment and distribution.		
Major Potential Hazards	Pathogens : Septic Tanks, Animal manure Chemicals: Agricultural, Algal Nutrients Fe, Mn, other metals (bore)		
Hazardous Events	Rainfall with run off Evaporation		
Existing Control Measures	Algicide Water saver Destratification aeration		
Operating Procedures	None		
Targets and Critical Limits	**Parameter**	**Target**	**Critical Limit**
	Blue Green Algae (counts/mL)	8000 *BB/DC*	24,000 BB/DC
	TDS (mg/L)	500	1000
	DO (mg/L)	**BB**	
	Geosmin (ng/L)	*BB*	
	Turbidity (NTU)	*BB*	
	EC mS/m	*BB*	
	Temp	*BB*	
	Taste and Odour	Acceptable *BB/DC*	
Monitoring	Tenant Ck online Tb, EC, DO, pH Reservoir Tb, Fe, Mn Reservoir temperature and DO profile On line continuous raw water turbidity Taste and odour check Geosmin MIB and algal toxins Bore TDS, Fe, Mn		
Monitoring Procedures	None		
Corrective Actions	Limited for this control point Consider use of alternative off takes Slow operation of plant		
Corrective Action Procedures	None		
Records	Informal storage of monitoring data on WTP computer hard drive Informal storage on daily monitoring sheet at WTP		
Notifications	Blue green algae numbers: DHS Geosmin, MIB, toxins: DHS		

Catchment and Reservoir
Control Point Action Summary 2007

Control Point	Catchment/ Reservoir		
Type of Action	**Action**	**Priority**	***Officer(s)***
Control Measures to be Implemented	WPW representative to seek formal representation • CMA • VFF • Local council • CFA	1	SP, PW
	WPW representative to provide briefings to CMA, VFF, local council and CFA on water quality awareness and their potential impacts on water quality, in particular zoning control, riparian zone repair and fencing, septic tank codes and decreased fertiliser use	1	PW, (PM)
	Only pump from Bass river after main flush	1	
	Do not pump from bore if bore area is flooded	1	
Operating Procedures to be Developed	Algal sampling and counting	1	DC
	Geosmin MIB and algal toxins monitoring	1	DC,BB
	Use of cupricide	1	Skeet, DC
	Use of water saver	2	DC,BB
	Bass River pumping	1	CB,BB
	Bore pumping	2	CB,BB
	Operation of destratification aerator	2	DC
	Taste and odour check system	2	DC
Formal Monitoring to be Developed	Tenant Ck on line data link to plant SCADA	2	DC, BB
	Reservoir temperature and DO profile	2	DC, BB
	Bore TDS, Fe, Mn	2	DC, BB
Additional Monitoring Required	Event *E coli*	1	DC
	Event *Crypto* and *Giardia*	2	DC
	Event pesticides and herbicides	1	DC
	Event nutrients (phosphate, ammonia and nitrate)	2	DC
	Biologically Active Compounds (incl endocrine disrupting chemicals)	2	DC
Corrective Action Procedures to be Developed	Selection and use of alternative off takes	2	DC,BB
Records	Develop data storage system for all operational and verification monitoring	1	BB,SP
	Implementation of IMS database		BB, SP
Notifications	Formalisation of notification procedures for • Blue green algae levels • Geosmin, MIB levels • TDS • other	1	BB,SP

Coagulation Flocculation
Control Point Summary

Control Point	Coagulation Flocculation		
Purpose	Destabilise colloidal particles to allow formation of floc. Poor coagulation will adversely effect filter function and disinfection.		
Major Potential Hazards	Pathogens Colour and NOM Turbidity		
Hazardous Events	Dosing malfunction Poor quality or incorrect chemicals Primary coagulant runs out Incorrect dose Poor control of coagulation pH Poor mixing Floc tank mixer failure		
Existing Control Measures	Duty standby dosing with automatic changeover Dosing pump failure alarms Automatic shutdown on dosing pump failure Alum storage level alarms Tank levels on SCADA Purchasing of coagulant under MAPS scheme Chemical delivery access controlled Floc mixer failure alarm Floc mixer failure shuts down plant pH meter calibration		
Operating Procedures	None		
Targets and Critical Limits	**Parameter**	**Target**	**Critical Limit**
	Coagulation pH	6 – 6.8	<5.5, > 7.5
Monitoring	On line raw water turbidity Raw water grab samples for Tb, Fe and Mn testing Visual inspection of floc in floc tanks		
Monitoring Procedures	None		
Corrective Actions	Jar testing to determine optimum dose (TRIM IN07-05776) Conduct draw down tests to establish dose Check dosing lines for leaks or blockages Check dosing pump operation Check coagulation pH		
Corrective Action Procedures	None		
Records	WTP daily monitoring sheet		
Notifications	None		

Coagulation Flocculation
Control Point Action Summary 2007

Control Point	Coagulation Flocculation		
Type of Action	**Action**	**Priority**	**Officer(s)**
Control Measures to be Implemented	On line pH measurement of coagulated water	2	BB,SP
	Monitor dosing rate using draw down tubes	1	BB,DC
	Ensure dosing lines are clear preventive maintenance	1	SP
	Regularly check 50Hz calibration	1	BB,DC
	Check full alarm function (electrical→ human)	1	
	Operator training	1	BB,KG
	Standard operating procedures	1	Various
	Chemical delivery check	2	BB,PW
	Regularly monitor coagulation pH	1	BB,DC
	Maintain optimum coagulation pH	1	BB,DC
	As required jar test alternative coagulants/polymers	2	BB,PM
Operating Procedures to be Developed	50 Hz dosing calibration	1	PM
	Chemical delivery check	2	BB,PW
Formal Monitoring to be Developed	Regular measurement of coagulation pH	1	BB,DC
	Establish and implement formal monitoring program at WTP		
Additional Monitoring Required	Grab sampling of coagulated water and slow mixing on jar tester.	2	PM,BB,DC
Corrective Action Procedures to be Developed			
Records	Develop data storage system for all operational and verification monitoring		
	Implementation of IMS database		
Notifications	Formalisation of notification procedures for failure of control point	1	BB,DC,SP

Dissolved Air Flotation
Control Point Summary

Control Point	Dissolved Air Flotation		
Purpose	To remove the majority of coagulated solids by flotation		
Major Potential Hazards	See hazardous events		
Hazardous Events	Poor distribution of bubbles Poor saturation Failure of saturator or recycle pumps Blocked distribution valves Float sinks Windy day		
Existing Control Measures	Monitor bubble distribution Monitor floated water turbidity Adjust DAF distribution valves Adjust float interval and duration Ensure float is removed prior to plant going offline Duty standby recycle pumps Dusty standby compressor Jar test		
Operating Procedures	None		
Targets and Critical Limits	**Parameter**	**Target**	**Critical Limit**
	Floated water Tb (NTU)	3	5
	Floated water true colour (PtCo)	15	
	Recycle ratio (%)	8 - 12	
	Saturator pressure kPa	550 – 600	
Monitoring	Monitor bubble distribution Floated water turbidity Float removal efficiency		
Monitoring Procedures	None		
Corrective Actions	Adjust distribution valves Adjust float interval and duration Clear blocked DAF valves Check recycle pumps Check compressor Jar test Direct filtration		
Corrective Action Procedures	None		
Records	Daily WTP observation sheet		
Notifications	None		

Dissolved Air Flotation
Control Point Action Summary 2007

Control Point	Dissolved Air Flotation		
Type of Action	**Action**	**Priority**	***Officer(s)***
Control Measures to be Implemented	Preventive maintenance program Enclose DAF cells	2 1	BB SP,BB
Operating Procedures to be Developed	Operation of plant in direct filtration mode	2	BB
Formal Monitoring to be Developed	Regular check of recycle ratio and saturator pressure	2	BB,DC
Additional Monitoring Required	Floated water turbidity	1	DC
Corrective Action Procedures to be Developed	Plant operation in direct filtration mode	2	BB
Records			
Notifications	Exceedence of critical limit, Plant Supervisor and General Manager notified		

Powdered Activated Carbon
Control Point Summary

Control Point	Powdered Activated Carbon		
Purpose	Removal of algal toxins and taste and odour chemicals		
Major Potential Hazards	Toxins		
Hazardous Events	Dosing malfunction PAC supply runs out Poor quality treatment chemical		
Existing Control Measures	Chemicals purchased through MAPS purchasing scheme		
Operating Procedures	None		
Targets and Critical Limits	**Parameter**	**Target**	**Critical Limit**
	Taste and odour	Acceptable	unacceptable
	Toxins		
	Geosmin		
	MIB		
Monitoring	Taste and odour sampling and testing Reservoir visual Microscopic identification of species Lab determination of toxins, MIB, Geosmin when required		
Monitoring Procedures	None		
Corrective Actions	Adjust PAC dose rate		
Corrective Action Procedures	None		
Records			
Notifications	DHS		

Powdered Activated Carbon

Control Point Action Summary 2007

Control Point	Powdered Activated Carbon		
Type of Action	**Action**	**Priority**	***Officer(s)***
Control Measures to be Implemented	Chemical quality acceptance check	2	PW,BB
Operating Procedures to be Developed	Dosing protocol	1	DC, PM
Formal Monitoring to be Developed			
Additional Monitoring Required			
Corrective Action Procedures to be Developed			
Records	Develop data storage system for all operational and verification monitoring Implementation of IMS database		
Notifications			

Potassium Permanganate
Control Point Summary

Control Point	Potassium Permanganate		
Purpose	For control levels of manganese (& iron) in the treated water		
Major Potential Hazards	See hazardous events		
Hazardous Events	Dosing malfunction Potassium Permanganate runs out Incorrect dose Poor quality chemical		
Existing Control Measures	Jar tests Draw down tests Dosing pump calibration Alarms on tank levels Chemicals purchased through MAPS purchasing scheme		
Operating Procedures	None		
Targets and Critical Limits		**Target**	**Critical Limit**
	Mn(sol) mg/L	0.02	0.1
Monitoring	Raw water Mn (sol), Fe (sol) CFE Mn (sol) Filter Mn (sol)		
Monitoring Procedures	None		
Corrective Actions	Adjust dose according to jar test and plant response		
Corrective Action Procedures	None		
Records	WTP daily work sheet		
Notifications	None		

Potassium Permanganate
Control Point Action Summary 2007

Control Point	Potassium Permanganate		
Type of Action	**Action**	**Priority**	**Officer(s)**
Control Measures to be Implemented			
Operating Procedures to be Developed	Control of Mn using Potassium Permanganate 50Hz dosing calibration	1 1	PM,KY PM
Formal Monitoring to be Developed			
Additional Monitoring Required			
Corrective Action Procedures to be Developed			
Records	Develop data storage system for all operational and verification monitoring Implementation of IMS database		
Notifications			

Media Filtration
Control Point Summary

Control Point	Media Filtration		
Purpose	Removal of residual solids including pathogens Sole barrier to protozoan pathogens		
Major Potential Hazards	Pathogens		
Hazardous Events	Incomplete or poor backwash Frequent stop start operation Surface sludge and filter blinding Media shrinkage or cracking Failure to reduce flow during backwash Long ripening period Rapid start up after backwash Sudden increase in flow rate Disruption of support gravels Hydraulic shock due to operation of valves Filter run time too long Filtration rate exceeds design		
Existing Control Measures	Individual filter Tb meters Calibration of Tb meters Regular observation of backwashes Flow rate reduced prior to backwash Reduce plant flows to maximise plant operation Ramp flow rate changes Reduce number of filters operating at lower demands Rest filters after backwashing Bed fluidisation checks Periodic dual filter backwashes Periodic draining and observation of filter surfaces Preparation of backwash profiles Jar testing		
Operating Procedures	Checking filter head loss gauges (TRIM IN07-05775) Jar test procedure (TRIM IN07-05776) Filter Inspection Procedure (Mosse & Murray 2007)		
Targets and Critical Limits		**Target**	**Critical Limit**
	Individual Filter Tb(NTU)	0.2	0.5 for 15 minutes
	Filtration rate (m/hr)	10	12
	Backwash Rate (m/hr)	55	< 35
	Terminal head loss		

Monitoring	Visual inspection SCADA trends Grab sample Tb Bed expansion Backwash profiles
Monitoring Procedures	None
Corrective Actions	Adjust air scour and backwash duration Adjust coagulant dose Dual backwashes Filter surface scraping
Corrective Action Procedures	None
Records	WTP daily operating sheet SCADA
Notifications	None

Media Filtration

Control Point Action Summary 2007

Control Point	Media Filtration		
Type of Action	**Action**	**Priority**	**Officer(s)**
Control Measures to be Implemented	Periodic preparation of filter run profile Modify DAF float removal method Annual filter inspections	2 1	BB,DC PM,BB,DC
Operating Procedures to be Developed	Filter inspection program	1	PM,BB,DC
Formal Monitoring to be Developed	Clean bed head loss QC charts Filter run profiles WTP monitoring plan	1 2 1	PM PM,BB,DC BB,DC
Additional Monitoring Required	Periodic determination of filtration rate Regular review of ripening period	2 2	BB,DC BB,DC
Corrective Action Procedures to be Developed			
Records	Develop data storage system for all operational and verification monitoring Implementation of IMS database		
Notifications	Formal notifications to be developed		

Chlorine Disinfection
Control Point Summary

Control Point	Chlorine Disinfection		
Purpose	Disinfection of treated water, final barrier for bacteria and viruses		
Major Potential Hazards	Pathogens		
Hazardous Events	Dosing malfunction (underdosing) Dosing malfunction (overdosing) Incorrect hypo batch strength Chlorine supply runs out Poor mixing Insufficient contact time, short circuiting Poor quality treatment chemicals		
Existing Control Measures	Dose rate monitored using load scales Duty standby injector and dosing pump systems Preventive maintenance of dosing and vacuum system Automatic chlorine changeover systems Chlorine ordering system Hypo injected through wand systems Hypo purchased through MAPS scheme Delivery site access is controlled Distribution system pH monitored		
Operating Procedures	SOP Chlorine Residual Maintenance in Distribution System (TRIM yet to be assigned)		
Targets and Critical Limits	**Parameter**	**Target**	**Critical Limit**
	Ct		
	Lower Critical Limit	**Target**	**Upper Critical Limit**
IBWPP	1.0	1.6	2.2
San Remo Basin Inlet	0.2	0.4	0.6
San Remo Basin Outlet	0.5	0.8	1.5
Churchill	0.3	0.5	0.7
Rhyll	0.3	1.0	1.5
Ventnor	0.5	1.0	1.7
Cowes Service Basin	0.3	1.0	1.3
Kilcunda	0.5	1.5	2.2
Corinella	0.5	1.5	2.0
Stanley Rd Grantville	0.4	1.0	1.5
June St Grantville	0.3	0.8	1.2
Grantville Pumps	0.2	1.0	2.0
Grantville Glen Alvie Tanks	0.2	1.0	2.0
Monitoring	**IBWPP**	daily	
	San Remo Basin Inlet	2/wk winter 3/wk summer	
	San Remo Basin Outlet	2/wk winter 3/wk summer	
	Churchill	1/wk	

	Rhyll	1/wk
	Ventnor	2/wk
	Cowes Service Basin	2/wk winter 4/wk summer
	Kilcunda	2/wk
	Corinella	2/wk winter 3/wk summer
	Stanley Rd Grantville	2/wk
	June St Grantville	2/wk
	Grantville Pumps	Off line
	Grantville Glen Alvie Tanks	2/wk
Monitoring (cont)	DHS weekly samples (Cl2 residuals, E coli, coliforms, HPC)	
Monitoring Procedures	None	
Corrective Actions	Flushing Modification of chlorine dose	
Corrective Action Procedures	None	
Records		
Notifications		

Chlorine Disinfection

Control Point Action Summary 2007

Control Point	Chlorine Disinfection		
Type of Action	**Action**	**Priority**	**Officer(s)**
Control Measures to be Implemented	Measure stock hypo strength and batch strength at hypo disinfection sites Dosing equipment failure alarms Set up low and low, low alarms and check function Check full alarm function Emergency power back up or complete site shut down if disinfection fails Set up high and high, high alarms and check function Residual trim chlorine dosing control Effective contact system structure Chemical delivery system check	1 1 1 1 1 1 1 1	PM,BB,SF SP SP PW, BB SP SP SP SP,PM
Operating Procedures to be Developed	Determination of hypo solution strength Distribution system cleaning Disinfection of tanks Disinfection of mains (on line) Disinfection of new mains	1	PM
Formal Monitoring to be Developed	Weekly chlorine residual monitoring (total and free Cl_2 residual, pH, turbidity)	1	(PM, BB,DC, SF for all)
Additional Monitoring Required	HPC 22C		
Corrective Action Procedures to be Developed	Response to notification of microbiologically non compliant distribution system samples Response to detection of under dosing Response to detection of overdosing Flushing in response to adverse results		
Records	Develop data storage system for all operational and verification monitoring Implementation of IMS database Detailed auditable record system to be developed		
Notifications	Formal notification system to be developed		

Distribution System
Control Point Summary

Control Point	Distribution System		
Purpose	To safely distribute treated water to consumers		
Major Potential Hazards	Pathogens: Introduced from mains breaks and repairs Animal (pest) or human access to storages Backflow from service lines or fire plugs Cross connections Chemicals: Backflow from service lines		
Hazardous Events	Mains breaks Failure of secondary disinfection Growth of biofilms		
Existing Control Measures	Covered treated water storages Inspection of floating covers Locked access to storages Backflow prevention devices fitted (including inspection program) Maintenance of positive pressure (needs to be verified)		
Operating Procedures	Limited. Located in O&M Operations Manual – Water Reticulation		
Targets and Critical Limits	**Parameter**	**Target**	**Critical Limit**
	Free Cl_2 ex storages	BB	
	Free Cl_2 at end of DS	measurable	0
	E coli	0	1
	Total THMs (ug/L)	250	250
	Chloroacetic Acids (ug/L)	100/150	100/150
	HPC 37^{o}C (cfu/mL)	BB	
	Turbidity	2	5
	Colour	15	
	Copper (mg/L)	1	2
	Iron (mg/L)		0.3
	Manganese (mg/L)	0.05	0.2
	pH	6.5-8.5	<6.5 >8.5
	Aluminium (mg/L)		0.2
	Langelier Index	>-1.5	
	Flow (m/sec)	20mm 15 L/m 25mm 30 L/m 32mm 60 L/m 40mm 90 L/m	
	Pressure		
Monitoring	Weekly bacteriological samples Chlorine residual measurements (Refer to Disinfection Schematic TRIM IN07-05758)		

Monitoring Procedures	Process for Collection of Water Quality Samples ver Draft 19042006 (TRIM IN07-05532) Water Sampling Sites-07-08 (TRIM IN07-05525)
Corrective Actions	If residuals are low (Steve actions here)
Corrective Action Procedures	None
Records	Chlorine residuals recorded on site and for DHS samples on Ecowise sheets Informal storage of monitoring data on WTP computer hard drive
Notifications	DHS monitoring data to Steven Porter, Brett Beaumont, Dean Chambers and Kylie White. Informal

Distribution System
Control Point Action Summary 2007

Control Point	Distribution System		
Type of Action	**Action**	**Priority**	**Officer(s)**
Control Measures to be Implemented	Maintain floating covers clean	1	Skeet
	Regular inspection of storages	1	Skeet
	Sanitary work practices	1	Skeet/PM/PW
	Flush and disinfect mains after repair or laying	1	Skeet
	Maintain residual >0.2 mg/L (free chlorine)	1	DC
	Maintain constant disinfectant residual	1	SF
	Establish comprehensive cleaning program	1	SP,Skeet
	Reduce hydraulic residence times	2	CB
	Develop a system of numbering, naming and filing SOPs and CAPs in TRIM	1	Meryl, PW
	Raise isolating valves in Bass Flats area on the 648 supply main	1	Skeet, APD
	Implement WSAA code for new mains	1	Skeet, APD
	Establish requirements for contract pipe laying companies	1	Skeet, APD
Operating Procedures to be Developed	Review and rewrite existing procedures	1	Various
	Response to mains break	1	
	Replacement mains	1	
	New mains	1	
	Secondary disinfection failure	1	
Formal Monitoring to be Developed			
Additional Monitoring Required	Regular chlorine residual surveys throughout distribution system (free Cl_2, total Cl_2 and free: total ratio)	1 1 2	DC/BB DC/BB
	Regular taste and odour surveys	2	DC
	Fe, Mn, Al, Tb monitoring program	2	DC/Skeet
	Determination of Langeliers Index	2	
	First draw copper		
Corrective Action Procedures to be Developed	Response to positive E coli	1	DC/BB
	Response to HPC	1	DC/BB
	Boil Water Alert	1	PW/Meryl
	Response to BGA toxin levels	1	PW/Meryl
Records	Develop data storage system for all operational and verification monitoring	1	
	Implementation of IMS database	1	
	Develop system for formal review of all monitoring data	1	
Notifications	Formalisation of notification procedures for all water quality items	1	

Organisational Structure and Work Practices

Control Point Summary

Control Point	Organisation Structure and Work Practices
Purpose	To provide an organisational structure and formal work practices that facilitate the achievement of safe drinking water objectives
Major Potential Hazards	Increased risk of producing unsafe drinking water
Hazardous Events	
Existing Control Measures	
Operating Procedures	
Targets and Critical Limits	**NA**
Monitoring	
Monitoring Procedures	
Corrective Actions	
Corrective Action Procedures	
Records	
Notifications	

Organisational Structure and Work Practices

Control Point Action Summary 2007

Control Point	Organisational Structure and Work Practices		
Type of Action	**Action**	**Priority**	***Officer(s)***
Control Measures to be Implemented	Organisational structure that reflects focus on water quality Organisational structure reflects ADWG philosophy of catchment to tap management Position Descriptions include specific reference to water quality responsibilities and accountabilities Performance appraisals include appraisal of water quality measures New staff induction program includes a specific water quality awareness component Water quality site familiarisation visits for all staff Utility wide reporting of key water quality indices Specific water quality awareness sessions Clear separation of water treatment plant operator responsibilities from other responsibilities Adequate resources to cover all responsibilities without compromising any water treatment control points Outcomes of water quality risk assessments feed into budget process OPEX budget provides for unplanned events and emergency management Participate in WSAA *A quality* program		
Operating Procedures to be Developed			
Formal Monitoring to be Developed	All water quality files (procedures, corrective action procedures, incident and emergency management procedures) stored in a centralised location and available to all staff		
Additional Monitoring Required			
Corrective Action Procedures to be Developed	Regular review of structure to assess suitability with respect to provision of safe drinking water		
Records	All water quality monitoring data stored on a		

	centralised server available to all staff WTP SCADA trends available at multiple sites		
Notifications	Formal notification system to be developed		

SECTION 4. ACTION ITEMS ARISING FROM HAZARD ANALYSIS AND RISK ASSESSMENT

Table 4.1 Consolidated List of Control Measures Requiring Implementation

Control Measure	Control Point	Priority
• WPW representative to seek formal representation on CMA,VFF, council, CFA • WPW representative to provide briefings to CMA, VFF, local council and CFA on water quality awareness and their potential impacts on water quality, in particular zoning control, riparian zone repair and fencing, septic tank codes and decreased fertiliser use • Only pump from Bass river after main flush • Do not pump from bore if bore area is flooded	Catch/Res	
• On line pH measurement of coagulated water • Monitor dosing rate using draw down tubes • Ensure dosing lines are clear preventive maintenance • Regularly check 50Hz calibration • Check full alarm function (electrical→ human) • Operator training • Standard operating procedures • Chemical delivery check • Regularly monitor coagulation pH • Maintain optimum coagulation pH • As required jar test alternative coagulants/polymers	Coag/Floc	
• Preventive maintenance program • Enclose DAF cells	DAF	
• Chemical quality acceptance check	PAC	
• Periodic preparation of filter run profile • Modify DAF float removal method • Annual filter inspections	Media Filtration	

• Measure stock hypo strength and batch strength at hypo disinfection sites • Dosing equipment failure alarms • Set up low and low, low alarms and check function • Check full alarm function • Emergency power back up or complete site shut down if disinfection fails • Set up high and high, high alarms and check function • Residual trim chlorine dosing control • Effective contact system structure • Chemical delivery system check	Disinfection	
• Maintain floating covers clean • Regular inspection of storages • Maintain clean storages • Sanitary work practices • Flush and disinfect mains after repair or laying • Maintain residual >0.2 mg/L (free chlorine) • Maintain constant disinfectant residual • Establish comprehensive cleaning program • Reduce hydraulic residence times • Raise isolating valves on air valves in Bass Flats area on the 648 supply main • Implement WSAA code for new mains • Establish requirements for contract pipe laying companies	Distribution	
• Establish organisational structure that reflects focus on water quality • Establish organisational structure reflects ADWG philosophy of catchment to tap management • Modify Position Descriptions to include specific reference to water quality responsibilities and accountabilities • Modify performance appraisals to include appraisal of water quality measures • Ensure new staff induction program includes a specific water quality awareness component • Organise water quality site familiarisation visits for all staff • Establish utility wide reporting of key water quality indices • Introduce specific water quality awareness sessions	Organisation Structure and Work Practices	

• Ensure clear separation of water treatment plant operator responsibilities from other responsibilities • Ensure adequate resources are available to cover all responsibilities without compromising any water treatment control points • Develop a system so that outcomes of water quality risk assessments feed into budget process • Allowance in OPEX budget provides for unplanned events and emergency management • Participate in WSAA *Aquality* program		

Table 4.2. Consolidated List of Operational Procedures to be Developed

Procedure	Control Point	Priority
• Algal sampling and counting • Geosmin MIB and algal toxins monitoring • Use of cupricide • Use of water saver • Bass River pumping • Bore pumping • Operation of destratification aerator • Taste and odour check system	Catch/Res	
• 50 Hz dosing calibration • Chemical delivery check	Coag/Floc	
• Operation of plant in direct filtration mode	DAF	
• Dosing protocol	PAC	
• Control of Mn using Potassium Permanganate • 50Hz dosing calibration	Potassium Permanganate	
• Filter inspection program	Media Filtration	
• Determination of hypo solution strength • Disinfection of tanks • Disinfection of mains (on line) • Disinfection of new mains	Disinfection	
• Review and rewrite existing procedures • Response to mains break • Replacement mains • New mains • Secondary disinfection failure • Distribution system cleaning	Distribution	

Table 4.3. Consolidated List of Monitoring to be Formalised or Developed

Monitoring	Control Point	Priority
• Tenant Ck on line data link to plant SCADA • Reservoir temperature and DO profile • Bore TDS, Fe, Mn Event *E coli* • Event *Crypto* and *Giardia* • Event pesticides and herbicides • Event nutrients (phosphate, ammonia and nitrate) • Biologically Active Compounds (incl endocrine disrupting chemicals)	Catch/Res	
• Regular measurement of coagulation pH • Establish and implement formal monitoring program at WTP • Grab sampling of coagulated water and slow mixing on jar tester.	Coag/Floc	
• Periodic determination of filtration rate • Regular review of ripening period	Media Filtration	
• Weekly chlorine residual monitoring (total and free Cl_2 residual, pH, turbidity) • HPC 22C	Disinfection	
• Regular chlorine residual surveys throughout distribution system (free Cl_2, total Cl_2 and free: total ratio) • Regular taste and odour surveys • Fe, Mn, Al, Tb monitoring program • Determination of Langeliers Index • First draw copper	Distribution	
• Ensure all water quality files (procedures, corrective action procedures, incident and emergency management procedures) stored in a centralised location and available to all staff	Organisational structure and Work Practices	

Table 4.4. Consolidated List of Corrective Action Procedures to be Developed

Corrective Action Procedure	Control Point	Priority
• Selection and use of alternative off takes	Catch/Res	
• Adjust dose according to jar test and plant response	Potassium Permanganate	
• Response to notification of microbiologically non compliant distribution system samples • Response to detection of under dosing • Response to detection of overdosing • Flushing in response to adverse results	Disinfection	
• Response to positive E coli • Response to HPC • Boil Water Alert • Response to BGA toxin levels	Distribution	
• Implement a regular review of organisation structure to assess suitability with respect to provision of safe drinking water	Organisation Structure and Work Practices	

Table 4.5. Consolidated List of Records to be Developed

Record	Control Point	Priority
• Develop data storage system for all operational and verification monitoring • Develop a system of numbering, naming and filing SOPs and CAPs in TRIM • Implementation of IMS database • Ensure all water quality monitoring data is stored on a centralised server available to all staff • Ensure WTP SCADA trends available at multiple sites	All	

Table 4.6. Consolidated List of Notifications to be Developed

Notification	Control Point	Priority
• Develop a complete set of notifications for each control point and each set of target objectives and critical limits	All	

Table 4.7. Audit and Review

Audit and Review	Control Point	Priority
• Develop a system for the review of all process monitoring and verification monitoring data • Develop a system of internal and external audit • Develop in internal review system	All	

SECTION 5. WQMS ACTION PLAN October 2007- December 2008

The items identified in the consolidated lists (Section 4) were considered individually by the RMP working group and prioritised for action for the remainder of 2007 and 2008. The majority of the items were afforded a high priority for implementation in this period. Consequently the tabulated lists below are very similar to those in Tables 4.1 to 4.7, however there are a few items that were decided to be of secondary importance at this stage and are not included. The following Tables therefore represent the Westernport Water, Water Quality Management System High Level Action Plan for 2007 and 2008 calendar years.

The tables also include a very rough estimate of the time necessary for completion of the task. Where the item is a one off action, a total time has been estimated. Where the action is a recurring action, an estimate of the time and frequency is provided.

Control Measures	Time	Responsible Officer
• WPW representative to seek formal representation on CMA,VFF, council, CFA • Only pump from Bass river after main flush • Do not pump from bore if bore area is flooded	4 hrs/m 0 0	
• On line pH measurement of coagulated water • Monitor dosing rate using draw down tubes • Ensure dosing lines are clear, preventive maintenance • Regularly check 50Hz calibration • Check full alarm function (electrical→ human) • Operator training • Chemical delivery check • Regularly monitor coagulation pH • Maintain optimum coagulation pH	5d 1.5 hrs/w 1 d/yr 1 day/m 1 day/yr varies 1 d 1hr/w	
• Preventive maintenance program • Enclose DAF cells	3m 14 d	
• Chemical quality acceptance check	1d	
• Periodic preparation of filter run profile • Modify DAF float removal method • Annual filter inspections	1 d/q 20 d 3 d/yr	
• Measure stock hypo strength and batch strength at hypo disinfection sites • Dosing equipment failure alarms • Set up low and low, low alarms and check function • Check full alarm function	2d/m 0 14 d 5d/yr	

• Emergency power back up or complete site shut down if disinfection fails • Set up high and high, high alarms and check function • Residual trim chlorine dosing control • Chemical delivery system check	14d see above see above 1d	
• Maintain floating covers clean • Regular inspection of storages • Maintain clean storages • Sanitary work practices • Flush and disinfect mains after repair or laying • Maintain residual >0.2 mg/L (free chlorine) • Maintain constant disinfectant residual • Establish comprehensive cleaning program • Reduce hydraulic residence times • Raise isolating valves on air valves in Bass Flats area on the 648 supply main • Implement WSAA code for new mains • Establish requirements for contract pipe laying companies	3d/q 1d/m 2d/yr 7days 3hr/break 15 d 10d 20d 5d 5d	
• Establish organisational structure that reflects focus on water quality • Establish organisational structure reflects ADWG philosophy of catchment to tap management • Modify Position Descriptions to include specific reference to water quality responsibilities and accountabilities • Modify performance appraisals to include appraisal of water quality measures • Ensure new staff induction program includes a specific water quality awareness component • Organise water quality site familiarisation visits for all staff • Establish utility wide reporting of key water quality indices • Introduce specific water quality awareness sessions • Ensure clear separation of water treatment plant operator responsibilities from other responsibilities • Ensure adequate resources are available to cover all responsibilities without compromising any water treatment control points • Develop a system so that outcomes of	5 d see above 1 week 1 week 1 week 1 week 14 days 2d/yr 5 d 5 d 5d	

water quality risk assessments feed into budget process • Allowance in OPEX budget provides for unplanned events and emergency management • Participate in WSAA *Aquality* program	5d 5d/yr	
Procedures		**Responsible Officer**
• Algal sampling and counting • Geosmin MIB and algal toxins monitoring • Use of cupricide • Use of water saver • Bass River pumping • Bore pumping • Operation of destratification aerator • Taste and odour check system	1d 1d 1d 1d 1d 1d 1d 1d	
• 50 Hz dosing calibration • Chemical delivery check	1d 1d	
• Dosing protocol	1d	
• Control of Mn using Potassium Permanganate	2d	
• Filter inspection program	1d	
• Determination of hypo solution strength • Disinfection of tanks • Disinfection of mains (on line) • Disinfection of new mains	1d 1d 1d 1d	
• Review and rewrite existing procedures • Response to mains break • Replacement mains • New mains • Secondary disinfection failure • Distribution system cleaning	5d 1d 1d 1d 2d 5d	
Monitoring		
• Tenant Ck on line data link to plant SCADA • Reservoir temperature and DO profile • Bore TDS, Fe, Mn Event *E coli* • Event *Crypto* and *Giardia* • Event pesticides and herbicides • Event nutrients (phosphate, ammonia and nitrate) • Biologically Active Compounds (incl endocrine disrupting chemicals)	2d 4h/wk 4hr/wk 5d/yr see above see above see above	
• Regular measurement of coagulation pH • Establish formal monitoring program at	3hr/wk 2d	

WTP • Implement formal monitoring program at WTP	1d/wk	
• Periodic determination of backwash rate • Regular review of ripening period	3d/yr 1hr/wk	
• HPC 22C	0	
• Regular chlorine residual surveys throughout distribution system (free Cl_2, total Cl_2 and free: total ratio)	2.5 d/survey	
• Ensure all water quality files (procedures, corrective action procedures, incident and emergency management procedures) stored in a centralised location and available to all staff	10d	
Corrective Action Procedures		
• Selection and use of alternative off takes	1d	
• Adjust KMnO4 dose according to jar test and plant response	1d	
• Response to notification of microbiologically non compliant distribution system samples • Flushing in response to adverse results	2d 2d	
• Response to positive E coli • Response to HPC • Boil Water Alert • Response to BGA toxin levels	1d 1d 5d 2d	
• Implement a regular review of organisation structure to assess suitability with respect to provision of safe drinking water	5d	
Records		
• Develop data storage system for all operational and verification monitoring • Develop a system of numbering, naming and filing SOPs and CAPs in TRIM • Implementation of IMS database • Ensure all water quality monitoring data is stored on a centralised server available to all staff • Ensure WTP SCADA trends available at multiple sites	15d 3d 20d 20d 20d	

Notification	Time	Responsible Officer
• Develop a complete set of notifications for each control point and each set of target objectives and critical limits	10d	
Audit and Review		
• Develop a system for the review of all process monitoring and verification monitoring data • Develop a system of internal and external audit	15d 15d	

Appendix 1

Westernport Water, Water Supply System Plan

Appendix 2

Westernport Water Verification Monitoring Program

Appendix 3

Westernport Water, Water Quality Management Documents

Westernport Water Procedure for Business Risk Management (Draft July 2006).