NSW Guidelines for Drinking Water Management Systems

NSW Health
NSW Department of Primary Industries - Office of Water

2013

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Content

Tables and Figures

Key Terms and Abbreviations

ABS	Australian Bureau of Statistics
ADWG	*Australian Drinking Water Guidelines 2011*. Primary guidance for drinking water quality and management within Australia. Copies are available at: http://www.nhmrc.gov.au/guidelines/publications/eh52
Annual Action Plan	An Annual Action Plan to Council is required following review of each utility's TBL performance report. The plan closes the 'planning loop' with the utility's strategic business plan and addresses any emerging issues or areas of under-performance.
C.t	Disinfectant residual concentration chlorine (C, in mg/L), multiplied by contact time (t, in minutes); a measure of disinfection effectiveness.
Best-practice management framework (BPMF)	The NSW *Best-Practice Management of Water Supply and Sewerage Framework* (www.water.nsw.gov.au). This is the driver of reform of planning and management and for continuing productivity and performance improvement of water supply and sewerage in regional NSW. The Framework provides best-value sustainable water services and is based on the *Best-Practice Management of Water and Sewerage Guidelines*.
Best Practice management of Water and Sewerage Guidelines (BPMG)	The NSW *Best-Practice Management of Water and Sewerage Guidelines* encourage continuing productivity and performance improvement through planning, regulation and pricing, supply security and performance monitoring.
CCP	Critical Control Point: an activity, procedure or process at which control can be applied and which is essential to prevent a hazard or reduce it to an acceptable level.
CMA	Catchment Management Authority. From 2014 CMAs will be replaced by regional Local Land Services.
Critical Control Monitoring Point	The point where monitoring is undertaken for a CCP. The monitoring point may be different to the control point.
DWMS	Drinking Water Management System: The documents, procedures and other supporting information for the safe supply of drinking water. This satisfies the requirement for a quality assurance program in the *Public Health Act 2010*.
DWMS coordinator	The person responsible for maintaining the currency of the DWMS
DWMS document	The document that records the procedures and files that makes up the Drinking Water Management System.
DWMS leader	The person responsible for the preparation and oversight of the DWMS
EPA	Environment Protection Authority (NSW)
Example DWMS/risk assessment reports	Referred to in these Guidelines and available at http://www.health.nsw.gov.au/environment/water/Pages/drinkwater-nsw.aspx
Framework	Framework for Management of Drinking Water Quality: Drinking water-specific quality assurance framework. Quality assurance programs within the Public Health Regulation 2012 are required to take the Framework into account.
GIS	Geographic Information System

Key Terms and Abbreviations

Improvement Plan	A Drinking Water Quality Management Improvement Plan or Continuous Improvement Plan as required under Element 12 of the Framework. (See Section 3.12)
IWCM	Integrated Water Cycle Management: A water utility's 30-year IWCM Strategy identifies the water supply, sewerage and stormwater scenario which provides best value for money on the triple bottom line basis of social, environmental and economic considerations
Local water utility	A water utility exercising drinking water supply functions under the *Local Government Act 1993* or the *Water Management Act 2000* (a water supply authority, general purpose council or county council).
NOW	NSW Office of Water www.water.nsw.gov.au, urbanwater@water.nsw.gov.au or (02) 8281 7321
Preventive Measure	Any planned action, activity or process that is used to prevent hazards from occurring or to reduce them to acceptable levels.
Quality Assurance Program	A program required under Section 25 of the *Public Health Act 2010*, for assuring the quality of water supplied for drinking.
Risk Assessment Report	A report that summarises water quality risks from catchment to consumer
Risk Assessment Workshop	An independently facilitated, interagency, multidisciplinary water quality workshop conducted as part of Elements 2 and 3 of the Framework.
Strategic Business Plan (SBP)	Strategic Business Plan: A 20 to 30 year strategic business plan and financial plan is a utility's peak planning document for water supply and sewerage in accordance with the NSW *Water and Sewerage Strategic Business Planning Guidelines 2011* (www.water.nsw.gov.au)
SCADA	Supervisory Control and Data Acquisition
TBL	Triple Bottom Line
Water supplier	Any supplier of drinking water defined under the *Public Health Act 2010*.

SECTION 1

Purpose and Background

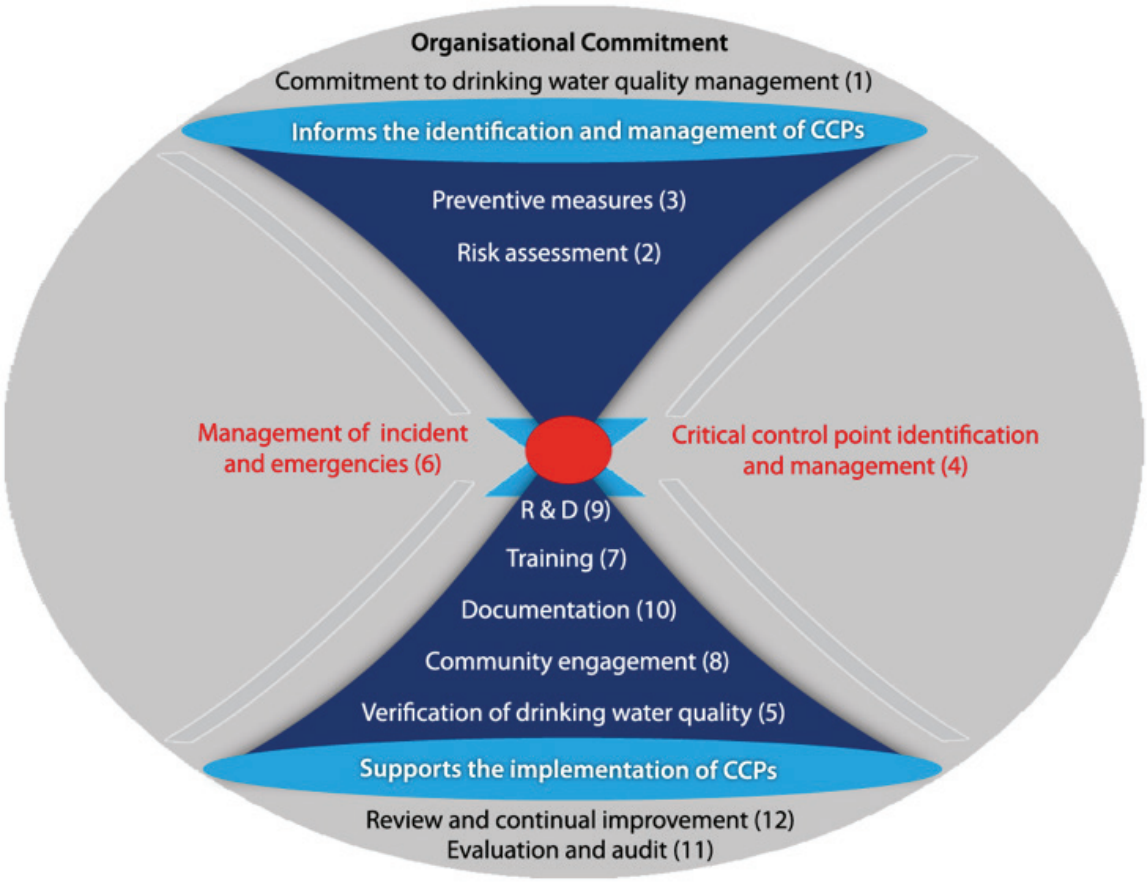
This document provides guidance on the development and implementation of a Drinking Water Management System (DWMS) for water suppliers in NSW including local water utilities and larger private suppliers. The DWMS is described within a water supplier-specific document and underpinned by a range of supporting documents, databases and processes. This guidance should be read in conjunction with Chapters 2-4, 9-10 and Appendices 1 and 2 of the *Australian Drinking Water Guidelines* (ADWG, 2011).

The ADWG contain the *Framework for Management of Drinking Water Quality* (the Framework). The Framework provides a structured risk-based approach to drinking water management. The Framework comprises 12 Elements broken down into 32 Components and 76 Actions (Chapter 3 ADWG, 2011). Figure 1-1 illustrates how the implementation of these elements ensures the consistent safe supply of drinking water.

At the heart of the Framework is the identification and management of Critical Control Points (CCPs). A CCP is an activity, procedure or process that is essential to prevent a water quality hazard or reduce it to an acceptable level. Appropriate selection of CCPs is important, as CCPs are the focus of process control for the production of safe drinking water.

Separate guidance is available for small private water suppliers and water carters http://www.health.nsw.gov.au/environment/water/Pages/drinking-watersuppliers.aspx

Figure 1 1. Diagram showing relationship of the Framework Elements.



SECTION 2

Developing a Drinking Water Management System

2.1 Steps

The following steps need to be undertaken to develop a DWMS:

1. Identify participants:	Decide who will be responsible for preparing the DWMS (DWMS Leader) and who will keep the system up to date (DWMS Coordinator).
2. Document current practice:	Review and document current practice. Document the extent to which current practice aligns with requirements of a DWMS. Chapter 3 details activities the water supplier should already be undertaking that align with the ADWG Framework.
3. Map the supply system	Map the water supply system from source to consumer.
4. Conduct a risk assessment and identify gaps:	Conduct a risk assessment workshop to identify hazards, preventive measures and risks in all parts of the supply system. Develop operational procedures, critical control points and critical control limits. Document gaps between current practice and the requirements of a DWMS into an Improvement Plan (See Element 12, Section 3.12).
5. Prioritise improvements and actions:	Prioritise gaps into immediate actions and actions that can be addressed in the short, medium and long term.
6. Undertake immediate improvements and actions and implement the DWMS:	Complete immediate, short, medium and long term actions as appropriate. See Table 2-1 for guidance on implementation of the DWMS.
7. Submit to NSW Health Public Health Unit for Review	The local Public Health Unit will review the DWMS in consultation with the NSW Office of Water. This review will note any areas for improvement in future revisions. Any critical matters must be addressed immediately. Existing DWMS documents will also be reviewed for consistency with these Guidelines and the ADWG Framework.
8. Review and continuous Improvement	Review the Improvement Plan and other DWMS documents regularly to ensure the DWMS is current and effective.

2.2 Creating a DWMS document

Example DWMS documents are provided at http://www.health.nsw.gov.au/environment/water/Pages/drinkwater-nsw.aspx. The templates are structured on the Framework Elements, Components and Actions. The water supplier may refer to the relevant template to create its own DWMS document.

Suppliers operating multiple systems

Water suppliers serving more than one water supply system/scheme may prepare a single DWMS document. However, elements 2, 3, 4 and 5 must be addressed for each system.

Table 2 1. Requirements for developing a DWMS document.

Element	What needs to be complete prior to submission to NSW Health
Element 1: Commitment to Drinking Water Quality Management	Review the water supplier's policy and planning documents (see Table 3-1) and record in the DWMS document. Review regulatory and formal requirements Record how the water supplier satisfies Element 1 and how these requirements are communicated to staff. Identify areas for improvement and record in the Improvement Plan (Element 12).
Element 2: Assessment of the Drinking Water Supply System	A risk assessment of the drinking water system must be undertaken: ■ Assemble a team to undertake the risk assessment. ■ Draw the system from catchment to consumer. ■ Review and analyse water quality data. ■ Develop a workshop briefing paper. ■ Hold a hazard identification, preventive measure identification and risk assessment workshop. ■ Record the workshop outcomes. In the DWMS document, record the details of the risk assessment process and append the Risk Assessment Report.
Element 3: Preventive Measures for Drinking Water Quality Management	Critical control points must be identified based on the risk assessment findings. Critical limits must be set. Record CCP details in the DWMS document and ensure that the information is in place and easy to see, at the CCP location or control room.
Element 4: Operational Procedures and Process Control	Record procedures for: ■ Managing critical control points and the communication protocol for a CCP exceedance. ■ Operational monitoring and corrections. ■ Chemical and equipment procurement, delivery and testing. ■ Confirm and record the disinfection C.t where chlorine / chloramine is used as the primary disinfectant. ■ Calibration, operation and maintenance of critical treatment equipment. Include references to these procedures in the DWMS document.
Element 5: Verification of Drinking Water Quality	The DWMS document must reference an implemented comprehensive monitoring program of the distribution system. The DWMS document must note how the water supplier responds to and reviews the NSW Health Drinking Water Monitoring Program results.
Element 6: Management of Incidents and Emergencies	Define incidents and emergencies which require management Develop a contact list and communication protocol for incidents and emergencies. Write in the DWMS document where controlled copies of the contact list are kept. Reference the protocols to be followed in case of incident or emergency. The NSW Health Response Protocols should be used for managing water quality incidents. These are available at http://www.health.nsw.gov.au/environment/water/Pages/drinking-water.aspx

Element	What needs to be complete prior to submission to NSW Health
Element 7: Employee Awareness and Training	In the DWMS document record the management, review and record keeping processes for staff training. The DWMS document must include how the water supplier maintains and improves employees' and contractors' awareness of water quality issues.
Element 8: Community Involvement and Awareness	Develop a protocol for community consultation during operational issues that may impact on the community. Refer also to the Community Involvement guidance in Table 3-1. The water supplier must record in the DWMS document how it engages with the community on drinking water quality issues and takes the community's and consumers' objectives into account when managing the water supply system.
Element 9: Research and Development	Review the Risk Assessment outcomes for identified water quality investigations. In the DWMS document, record all water quality investigations in which the water supplier is involved. In the DWMS document, record the processes for equipment and plant validation. Confirm and record the disinfection C.t where chlorine / chloramine is used as the primary disinfectant (if not already addressed under Element 4).
Element 10: Documentation and Reporting	Record in the DWMS document the record keeping procedures and systems used by the water supplier. Record how monitoring results (operational monitoring, incidents and emergencies and water quality review) and responses are reported to management and external parties.
Element 11: Evaluation and Audit	Record the processes by which the water supplier undertakes long-term evaluation of its water quality data and considers whether updates or improvements are required in the DWMS document. The water supplier should record how it satisfies the internal and external auditing requirements of this element including a schedule for internal and external audits.
Element 12: Review and Continual Improvement	Water suppliers should review the management system and its implementation at least annually, to ensure that it maintains currency with the drinking water supply. A record of this review should be kept. A complete review of all management systems should occur every four years in line with the review of the Strategic Business Plan. The scheduled dates for these reviews should be included in the DWMS document.

SECTION 3

Developing a Drinking Water Management System in NSW

Section 3 provides guidance for producing a DWMS document in the NSW context.

3.1 Element 1: Commitment to Drinking Water Quality Management

This element involves the development of a drinking water quality policy, understanding regulatory and formal requirements and understanding and engaging with stakeholders. An organisation-endorsed Drinking Water Management System would satisfy this element.

What needs to be done:

- Review your water supplier's planning documents (see Table 3-1) and record in the DWMS document.
- Review regulatory and formal requirements.
- Record how your water supplier satisfies Element 1 and how these requirements are communicated to staff.
- Identify areas for improvement and record in the Improvement Plan (Element 12).

Regulatory and formal requirements

A Drinking Water Management System developed and implemented in line with these guidelines satisfies the requirement for a quality assurance program in the *Public Health Act 2010*. For many water suppliers this will include complying with requirements of the NSW *Health Drinking Water Monitoring Program* and the NSW *Code of Practice for Fluoridation of Public Water Supplies*. Local water utilities must also comply with the NSW *Best-Practice Management of Water Supply and Sewerage Framework* and *Best Practice Management of Water Supply and Sewerage Guidelines*.

Local water utilities are required to undertake planning activities that satisfy Element 1 of the Framework. These activities include:

- **Integrated Water Cycle Management strategy (IWCM)**

IWCM is a requirement of the NSW Best-Practice Management of Water Supply and Sewerage Framework and *Best Practice Management of Water Supply and Sewerage Guidelines* available at: http://www.water.nsw.gov.au/Urban-water/Country-Towns-Program/Best-practice-management/Planning-and-best-practice/default.aspx, and http://www.water.nsw.gov.au/ArticleDocuments/36/utilities_nsw_water_sewerage_strategic_planning_guidelines.pdf.aspx

Local water utilities should prepare an IWCM strategy to meet the Best Practice Guidelines. A water utility's 30-year IWCM Strategy identifies the water, sewerage and stormwater scenario which provides best value for money on a triple bottom line basis (social, environmental and economic considerations). The NSW *Strategic Business Planning Guidelines* require that NSW water utilities address the stringent requirements of NSW *Best-Practice Management of Water Supply and Sewerage Guidelines, 2007*. Utilities which do so fully address the local government Integrated *Planning and Reporting Requirements*.

- **Strategic Business Plan (SBP), Financial Plan and Asset Management Plans:**

Local water utilities should prepare a SBP every 4 years as described in the NSW Water and *Sewerage Strategic Business Planning Guidelines* 2011. Components of the SBP meet a number of the actions within Element 1. The regular review and revision of the SBP meet the requirements for periodic review in the Framework. When the SBP is reviewed, ensure that actions in the Improvement Plan (Element 12) are included the planning process.

- **Annual Performance Monitoring**

Include preparation of an annual Action Plan to review the utility's performance and identify and address any emerging issues or areas of underperformance.

Other Activities

Many local water utilities report water quality results and exceptions to their Council as part of monthly or quarterly reporting. This reporting is an acceptable way to demonstrate stakeholder commitment and involvement.

Further Work

As part of the SBP review, update the following in the SBP:

- Ensure the mission statement includes public health / water quality objectives.
- Ensure that levels of service include public health / water quality objectives.
- Clarify public health / water quality implications of the operating environment review.
- Review water supplier responsibilities captured in other documents such as Codes of Practice and Standards.

Table 3-1. Link between NSW planning documents and Element 1 of the Framework.

Document	Document Reference		Link to Framework Component
NSW Water and Sewerage Strategic Business Planning Guidelines	Section 6	Mission Statement	Drinking Water Quality Policy
	Section 7	Levels of Service	
	Section 5	Operating Environment Review	Regulatory and Formal
	Appendix D	Legislative Framework	
	Section 9.4	Consumer and Community Involvement	Engaging Stakeholders
	Section 5.1	Institutional Arrangements for Service Provision	
	D4	Approved by Council	Endorsed by Senior Executives
Planning and Reporting Guidelines for Local Government in NSW	Sec 1.5 (p9)	Community Engagement Strategy	Engaging Stakeholders
Integrated Water Cycle Management Guidelines for NSW Local Water Utilities	Chapter 2	The Framework – Who is involved?	Regulatory and Formal Requirements
	Chapter 2	The Framework – Who is involved?	Engaging Stakeholders
	Table 6	Potential Stakeholders for the IWCM process in NSW	
	3.1	Step 1 Assemble a team	
	3.2	Step 2: Assess the current situation and set objectives	

3.2 Element 2: Assessment of the Drinking Water Supply System

A team experienced in water quality and treatment should undertake a water quality risk assessment of the water supply system. Historical water quality data should be reviewed and the water supply system documented before undertaking the water quality risk assessment. The risk assessment should be undertaken in a workshop format. NSW Health recommends that an external facilitator be engaged for the risk assessment workshop.

What needs to be done:

- A risk assessment of the drinking water system must be undertaken:
  - Assemble a team to undertake the risk assessment.
  - Draw a flow diagram of the system from catchment to consumer.
  - Review and analyse water quality data.
  - Develop a workshop briefing paper.
  - Hold a hazard identification, preventive measure identification and risk assessment workshop.
  - Record the workshop outcomes in a Risk Assessment Report.
- In the DWMS document, record the details of the risk assessment process and append the Risk Assessment Report.

Assemble a Team

The following roles should be represented on the DWMS team:

- **Coordination role** – the person responsible for developing and maintaining the DWMS. This may be the water quality officer, water engineer or risk manager.
- **Leadership role** – the person who is championing the development of the DWMS. This may be the water manager, technical director or general manager depending on the size of the organisation.
- **Operators** – system operators covering all components of the water supply system/scheme (catchment, treatment and distribution).
- **Environmental Health Officer** - the person who is responsible for local health issues, water sampling and/or reviewing results.
- **NSW Health representative** – the person who will assist with the identification of health risks associated with drinking water supply and the management of those risks. A representative of the local Public Health Unit should be invited to the risk assessment workshop.
- **Water quality and treatment process expert** – the person who will assist with the identification and operation of the process controls. The NOW inspector for the region should be invited to the workshop.

One person may cover several roles.

Draw the System

Prepare a system flow diagram that is representative of the whole water system from catchment to consumer, using the information sources in Table 3-2 as a guide. Include details of water sources, land use and infrastructure within catchments, on-stream storages and reservoirs, treatment plants, distribution systems, the numbers and distribution of consumers and variations in water demand.

Table 3-2. Sources of information to develop a catchment to consumer flow diagram.

Source	Information	Reference
ADWG	Requirements for flow diagram	Section 3.2.1 - Construct a flow diagram of the water supply system/scheme from catchment to consumer
IWCM	System boundaries	Section 3.2 - Step 2: Assess the current situation and set objectives
SBP	Key assets	Section 10 - Total Asset Management Plan
Other Water Supplier Sources	Process train, equipment sizing/capacity, flow direction, bypasses	Operation and Maintenance Manual / Design Specifications
		Commissioning Reports
		Process and Instrumentation Diagrams (P&IDs)
	System layout	Geographical Information System (GIS) Data

Review and Analyse Water Quality Data

Review the water quality data sources listed in Table 3-3. Statistically analyse the data and identifying as described in Section 3.10 of this document and Information Sheet 3.2 of the ADWG and the *Australian Guidelines for Water Quality Monitoring and Reporting* (2000). Investigate rainfall and streamflow data for impacts on water quality.

Table 3-3. Sources of water quality data.

Source	Information	Type
NSW Health Drinking Water Monitoring Program	Reticulation water quality	Verification Monitoring
NSW Health Project Monitoring	Project specific water quality data	Investigative
SCADA data	Real time raw, process, finished and distribution water quality	Operational
Operator physical testing	Raw, process, finished and distribution water quality	Operational
Laboratory physical testing	Raw, process, finished and distribution water quality	Verification and investigative monitoring
Annual NSW Water Supply and Sewerage Benchmarking Report – Appendix D1	The results of system performance verification monitoring for each LWU water treatment works/chlorinator/aerator	Verification monitoring and water quality complaints
State of Environment reporting	Raw water source quality	Investigative (in relation to water quality)
Algal Monitoring (e.g. Regional Algal Coordinating Committee (RACC))	Cell numbers and toxigenicity	Operational
Bureau of Meteorology	Rainfall, streamflow	Operational, investigative
NSW Office of Water	Streamflow	Operational, investigative

Develop Briefing Paper

Prepare a briefing paper for the risk assessment workshop describing each water supply system/scheme in sufficient detail to identify hazards and assess risk. Review the information available from the sources in Table 3-4. The briefing paper should:

- Contain a map of the catchment (including groundwater recharge areas) e.g. from Google Earth or GIS.
- Describe the catchment (its general morphology and characteristics, including land use).
- Identify the major towns and transport corridors in the catchment.
- Identify major pollution sources, such as mines, wastewater discharges, and intensive agricultural facilities.
- Summarise potentially polluting land uses, such as grazing, intensive agriculture, horticulture, forestry, sewerage infrastructure and urban and rural settlements.
- Identify and summarise the nature of the major rivers, weirs, dams, lakes and bores from which water is supplied.
- Explain how and under what conditions water is harvested from particular sources and fed into the water supply for treatment (e.g. pumping rules).
- Describe the treatment plant and its mode of operation.
- Describe the distribution and reticulation system.
- Identify relationships to third parties (including contractors) for water supply or receipt.
- Review previous incidents and their outcomes including incidents in similar water supplies/ schemes.
- Identify major changes to infrastructure.
- Include the water quality analysis.

Table 3-4. Sources of information for the risk assessment briefing paper.

Source	Information	Reference
ADWG	Key characteristics of the drinking water supply system	Appendix 1 - Additional guidance on Elements 2 and 3 of the Framework
NSW Health	Guidance on DWMS and risk assessment reports	Example DWMS and associated risk assessment summaries for different types of water supplies in NSW. http://www.health.nsw.gov.au/environment/water/Pages/drinkwater-nsw.aspx
IWCM Strategy	System boundaries	Section 3.2 -Step 2: Assess the current situation and set objectives
SBP	Key assets	Section 10 - Total Asset Management Plan
Other Organisation-derived Sources	Water supply system information	Operation and Maintenance Manual / Design specifications
		Commissioning reports
		Process and Implementation Diagrams
		GIS Data
	Potential sources of pollution	On-site wastewater treatment system register
		Trade waste register and licences
Other Organisation-derived Sources	Landuses, rivers, catchment boundaries	GIS Data (Council, water supplier, or other agencies)
	State of Environment Reporting	*Protection of the Environment Administration Act 1991* (NSW) Section 10
State Water	Water sources and water balances	http://www.statewater.com.au/
Regional Algal Coordinating Committee (RACC)	Algal Reports	http://www.water.nsw.gov.au/Water-Management/Water-quality/Algal-information/default.aspx
Catchment Management Authorities(CMAs).	Catchment landuses, riparian programs	Annual Reports, Catchment Action Plan http://www.cma.nsw.gov.au/
Australian Bureau of Statistics (ABS)	Population of upstream urban areas	http://www.abs.gov.au/
EPA (Environment Protection Authority)	Environment Protection Licences	www.environment.nsw.gov.au/prpoeoapp/
NSW annual *Water Supply and Sewerage Benchmarking Reports*.	Lessons from recent boil water alerts, maintaining effective disinfection of a water supply distribution system, Water Treatment Performance, results of system performance monitoring in each financial year for each water utility for water treatment works and water supply systems.	Reports are issued annually, see for example: http://www.water.nsw.gov.au/ArticleDocuments/36/utilities_performance_nsw_water_supply_and_sewerage_benchmarking_report_2010_11.pdf.aspx

Hazard Identification and Risk Assessment Workshop

The hazard identification and risk assessment (ADWG Section 3.2.3) and the identification of preventive measures for drinking water quality assessment (Element 3) are normally undertaken in a single Risk Assessment Workshop. For a small system, it is possible to complete both workshop components in a day. Large systems may require 2 or 3 days to complete the risk assessment workshop.

Maximum risk (the risk with no preventive measures in place) and residual risk (the risk with the preventive measures in place) should be assessed.

The risk assessment should identify actions for improvement such as introducing or enhancing preventive measures, as well as investigations to reduce uncertainties and further characterise risks. Actions identified in the risk assessment should be transferred to the Improvement Plan (Element 12), prioritised and followed up.

Record the outcomes of the Risk Assessment Workshop in a report. Guidance is provided by the example risk assessment reports available at http://www.health.nsw.gov.au/environment/water/Pages/drinkwater-nsw.aspx

The Risk Assessment Report should be referenced in the DWMS document.

3.3 Element 3: Preventive Measures for Drinking Water Quality Management

The most effective approach to managing drinking water quality is, where possible, to prevent a water quality incident occurring or to prevent the introduction of a water quality hazard to the drinking water system. Element 3 covers the identification of the preventive measures in place within the water supply system, paying particular attention to the concept of multiple barriers i.e. that a failure of one barrier may be compensated by effective operation of the remaining barriers.

What needs to be done:

- Critical control points must be identified based on the risk assessment findings.
- Critical limits must be set.
- Record the details in the DWMS document and ensure that the information is in place and easy to see, at the CCP location or control room.

The Framework recommends that the hazard identification should be completed along with the assessment of maximum risk. The influence of preventive measures on risk should be identified next. In practice the two are typically combined into one Risk Assessment Workshop, as described in Section 3.2.

The documents listed in Table 3-5 should be reviewed when evaluating the adequacy of the preventive measures in the system being assessed.

Table 3-5. Items to consider when assessing the adequacy of preventive measures.

Source	Information
Design Report for the Water Treatment Works	Functional descriptions and performance requirements for each treatment process
NSW Water Supply and Sewerage Benchmarking Reports	Guidance on chlorine residual in the reticulation
NSW Code of Practice for Fluoridation of Public Water Supplies (Fluoride Code)	Code of practice for fluoridation dosing, control and measurement http://www.health.nsw.gov.au/environment/water/Pages/drinking-water.aspx
Annual Action Plan prepared following review of the TBL performance report	Areas of underperformance
Previous reports (including Best Practice Management auditing and investigative reports)	Identified gaps

Catchment Protection

The ADWG note that protection of water sources is of paramount importance in reducing risks. Catchments can be protected by limiting access by humans and animals, limiting land uses to non polluting types that will not contribute to risk and the use of buffer zones. Development controls can be used to ensure that development within catchments is appropriate. Planning Instruments such as Local Environmental Plans (LEPs) may be used to help protect catchment integrity, for example inclusion of local provisions which restrict land use within catchments to types that will not pose a risk to water quality.

Water catchment areas can be declared under the *Local Government Act 1993* section 128 which may provide a layer of protection against land uses that pose risks to water quality.

Critical Control Points

A critical control point is defined as an activity, procedure or process at which control can be applied and which is essential to prevent a hazard or reduce it to an acceptable level.

Typical critical controls points include:

- Selective abstraction of raw water.
- Flocculation process
- Clarification process
- Filtration process.
- Disinfection process (eg. chlorination and/or UV).
- Reservoir integrity
- Reticulation system pressure (failure to maintain positive pressure).
- Chlorine residual in reticulation.
- Fluoridation.

Where flocculation is used, visual assessment of floc size and clarity of water quality must be conducted.

For each CCP, limits need to be set:

- A critical limit at which, if exceeded, control of the process is lost and water quality is not guaranteed. This **must** be set for each CCP.
- A target criterion, which represents a well-controlled process, **should** be set for each CCP, and corrective action undertaken when required.
- An adjustment limit **can** be set which indicates the point at which adjustment needs to be made to restore control and to avoid the critical limit being exceeded.

This information should be available from the Design Report and the specification for the treatment works. NOW and the local Public Health Unit can provide assistance on establishing appropriate targets, critical limits and adjustment limits. The ADWG require careful consideration of turbidity targets where filtration is used to control chlorine resistant pathogens.

Information relating to CCPs is typically recorded in a table. See the example DWMS and risk assessment documents for indicative CCP tables http://www.health.nsw.gov.au/environment/water/Pages/drinkwater-nsw.aspx

Information that represents a fluoride CCP table is shown in Table 3-6.

Table 3-6. Fluoride CCP table.

Item	Description
What is being measured?	Treated water fluoride
Where/how is it measured?	E.g. Outlet of balance tanks / daily sampling and testing
How is it controlled?	Fluoride dosing system
What are the hazards?	Fluoride overdosing and underdosing
Target Criterion	1 mg/L
Adjustment Limit	< 0.9 mg/L or > 1.1 mg/L
Critical Limits	>1.5 mg/L at any time, <0.9 mg/L for more than 72 hours

3.4 Element 4: Operational Procedures and Process Control

Effective control of multiple barriers within the water supply chain is fundamental to the consistent production of safe, quality drinking water. This element of the Framework requires a description of all preventive measures and their functions, including the wider processes such as control of materials and chemicals, equipment capability and maintenance. Element 4 describes the day-to-day operational application of the DWMS. The focus is on the daily and weekly activities of the operational staff.

What needs to be done:

- Record procedures for:
  - Managing critical control points and the communication protocol for a CCP exceedance.
  - Operational monitoring and corrections.
  - Chemical and equipment procurement, delivery and testing.
  - Calibration, operation and maintenance of critical treatment equipment.
  - Include references to the above procedures in the DWMS document.

Operational Procedures

Procedures should be developed for important preventive measures. These procedures should cover the operation, monitoring, maintenance and calibration associated with these preventive measures. Procedures should include details such as the following, where applicable:

- Document identification (version, responsibility, revision date, title).
- Aim and objectives.
- Roles and responsibilities.
- General background.
- Description of the procedure.
- Measurable criteria to be met.
- Flow diagram and/or summary table capturing the essence of the procedure.
- References to supporting information.

The procedures should be referenced in the DWMS document.

Operational Monitoring

An operational monitoring plan should be referenced in the DWMS document. Typical operational monitoring parameters may include:

- Raw water turbidity.
- Raw water pH.

- Clarified water turbidity and pH.
- Treated water turbidity.
- Fluoride concentration.
- Free chlorine residual after contact tank.
- Treated water pH.
- Free chlorine residual in the distribution system.

Operational monitoring results are usually recorded through the operator's log sheets and the online data collection capabilities of SCADA systems. Details for developing an operational monitoring plan can be found in ADWG Chapter 9.3. NOW inspectors can assist in developing the operational monitoring plan.

Guidance on maintaining effective disinfection of a water supply system is provided by NOW in its annual NSW Water Supply and Sewerage Benchmarking Reports.

Fluoridation

The *New South Wales Code of Practice for Fluoridation of Public Water Supplies* (Fluoride Code) requires a water supplier that is fluoridating its supply to maintain a daily record of:

- The volume of water treated.
- The quantity of fluoridating agent added over the same time period.
- The corresponding average calculated fluoride dose.
- The fluoride analysis result from the treated water sample taken during this time period.
- The stock of fluoridating agent on hand.

This information is recorded on either the standard forms (Form 2 for solution feed systems or Form 3 for dry feed systems and Form 4 for treated water) or on a site-specific plant log sheet. See the Fluoride Code for more information (9. Measurement of Fluoride in Treated Water, 10. Plant Operation and Process Control).

Equipment Maintenance

A regular inspection and maintenance program should be developed for the water supply system/scheme detailing:

- Operational procedures and records for the maintenance of equipment, including the calibration of monitoring equipment;
- Schedules and timelines;
- Who is responsible; and
- Equipment and personnel required.

Priority should be given to equipment (including monitoring equipment) associated with the CCPs. A sample checklist is provided in the template DWMS documents which can be accessed at http://www.health.nsw.gov.au/environment/water/Pages/drinkwater-nsw.aspx

Larger maintenance and equipment replacement should be carried into the Asset Management Plan within the SBP.

Materials and Chemicals

The DWMS document must record the procedures and systems used for the procurement of materials and chemicals (Table 3-7). Chapter 8 of the ADWG contains a list of approved water treatment chemicals and quality assurance measures. Water suppliers must ensure they have suitable procedures for the purchase and use of all chemicals, including those that are not purchased through tendering (e.g. chlorine tablets for hand dosing of reservoirs).

The water supplier must have documented procedures for the delivery and storage of chemicals. These procedures must state:

- That chemical deliveries are attended by trained water treatment plant operators.
- That a certificate of analysis is provided by the supplier at the time of delivery for each batch of chemical supplied and that the chemical satisfies the criteria specified in Chapter 8 of the ADWG, prior to the commencement of unloading.
- That the correct chemical is being delivered into the appropriate storage.
- How the water supplier ensures that the correct concentration has been supplied. This may be achieved through a simple density calculation for some chemicals. NOW can provide advice regarding testing chemicals upon receipt.

The Fluoride Code provides guidance on chemicals used for fluoridation (see 8. Control of Fluoridating Agent).

Table 3-7. Drinking water supply: standards and guidelines for chemicals and materials.

Document	Information
ADWG Chapter 8 Drinking Water Treatment Chemicals	Chemicals approved for addition to drinking water and quality assurance
AS/NZS 4020 Testing of products for use in contact with drinking water AS 2070:1999 Plastics materials for food contact use ATS 5200.026:2004 Technical Specification for Plumbing and Drainage Products, Cold Water Storage Products AS/ZS 4766:2006 Polyethylene storage tanks for water and chemicals Plumbing Code of Australia and AS/NZS 3500 (use current versions)	List of approved materials and products
Water supplier Procurement Procedures/Policy	Guidelines for procurement and approved suppliers
New South Wales Code of Practice for Fluoridation of Public Water Supplies	Fluoride specification, standard operating procedure for measurement of fluoride concentrations

Further Work

Water suppliers should record all processes and activities from catchment to consumer, including preventive measures, operational monitoring and verification procedures, and maintenance requirements.

Water suppliers should maintain a Water Supply Approved Chemical/Material Register and:

- Check the register against the list of chemicals approved in the ADWG.
- Check against the register before purchasing new chemicals.
- Make sure the register becomes a controlled document.

Include the following information for each chemical or material:

- Name (for chemicals, common name and scientific name).
- Use.
- Quantity stored.
- Purchased by.
- Purchase method (e.g. Supply Agreement).
- Approved supplier.
- Specification reference.
- Delivery, verification and receipt procedure.
- Storage method.
- Storage life.

3.5 Element 5: Verification of Drinking Water Quality

Verification of drinking water quality provides an assessment of the overall performance of the system at a single point in time. Verification monitoring demonstrates that the system is capable of providing water of the intended quality to all consumers. Verification monitoring for the purposes of the Framework includes drinking water quality and consumer satisfaction.

What needs to be done:

- The DWMS document must reference an implemented comprehensive monitoring program of the distribution system.
- The DWMS document must note how the water supplier reviews the NSW Health Drinking Water Monitoring Program results.

Verification Monitoring

Chapters 9 and 10 of the ADWG, NSW *Health Drinking Water Monitoring Program* and NSW *Water Supply and Sewerage Benchmarking Reports* provide information on how to develop a routine monitoring program (both operational and verification). Water suppliers should consult this information to develop and implement their monitoring program.

Guidance on chlorine residuals in the reticulation system can be found in NSW *Water Supply and Sewerage Benchmarking Reports*. Planned responses to water quality non-conformances should be identified in the DWMS document under Element 4 and 6 and be in line with the in the NSW Health Response Protocols available at:
http://www.health.nsw.gov.au/environment/water/Pages/drinking-water.aspx

Water suppliers that participate in the NSW *Health Drinking Water Monitoring Program* meet the requirements of water quality verification monitoring for independent verification of their system.

The DWMS document must also state who is responsible for reviewing the results in the NSW Drinking Water Database. Reviews must be conducted regularly including:

- After the results of each microbiological sample; and
- Monthly for trends and water quality implications.

NSW Health provides response protocols relating to microbiological quality, physical and chemical quality, treatment failure and *Cryptosporidium* and *Giardia* (See Element 6).

Fluoridation

The Fluoride Code requires a water supplier to maintain a daily record of fluoride concentration in water leaving plant, and a weekly record at two sites in the distribution system. This information is recorded on Form 4. Once per month a distribution system sample must be sent to the NSW Forensic and Analytical Science Service (FASS). See the Fluoride Code for more information (Sections 9. Measurement of Fluoride in Treated Water and 10. Plant Operation and Process Control).

Consumer Water Quality Complaints and Enquiries

The procedures for recording and responding to consumer water quality complaints and enquiries should be documented. Most water suppliers will use a consumer request management system. The water supplier should note in its DWMS document the review of consumer enquiries with reference to:

- Its monitoring program.
- System maintenance programs (flushing etc.).
- A water supply system/scheme risk assessment.
- Asset management program.
- NSW Performance Monitoring System (online data entry by utilities).

Further Work

Water suppliers should review their monitoring programs for adequacy in consultation with their local Public Health Unit.

3.6 Element 6: Management of Incidents and Emergencies

The water supplier needs to develop considered and controlled responses to water quality incidents or emergencies to protect public health, maintain consumer confidence and protect the reputation of the organisation. Emergency protocols must remain in place until the system can be returned to normal operating conditions.

What needs to be done:

- Develop a contact list for incidents and emergencies.
- Record in the DWMS document where controlled copies of the contact list are kept.
- Reference the protocols to be followed in case of incident or emergency.
- The NSW Health Response Protocols must be used for managing water quality incidents.

Incident and Emergency Protocols

Incidents may arise through many circumstances. Table 3-8 provides guidance on sources of information for managing incidents in NSW. Water suppliers should review the information available and tailor it to their needs in consultation with their local Public Health Unit. The DWMS document must state that the water supplier will follow the NSW Health protocols should a water quality incident occur.

When tailoring the incident and emergency protocols, the water supplier should discuss with key agencies under what circumstances notification should take place, and which personnel from the water supplier are authorised to communicate with these agencies.

Where the water supplier extracts from a surface connected system (surface water or shallow aquifer), they should ensure they will be contacted rapidly if an incident such as a spill or accident occurs in their catchment. Such an incident may involve discussions with the SES and local fire service, among others.

All staff and contractors should be trained in the application of the incident/emergency response plan and procedures. This training should be recorded in the water supplier's training register (Element 7). Training should focus on those incidents most likely to occur, for example chemical spills and microbial contamination.

After an incident or emergency has been resolved all the staff involved should be debriefed and this information used to improve the water supplier's incident and emergency response plan. The Framework provides advice on this (Chapter 3.6.2).

Internal and interagency communication

Water suppliers should have a contact list for incidents and emergencies which is available to all operational staff. The contact list should include contact information including name, work number, after-hours number, mobile number and pager number for the organisations listed in Table 3-9 as a minimum.

Table 3-8. Information sources for managing incidents in NSW.

Incident Type	Document Reference
Microbiological failure or threat	NSW Health Response Protocol – Management of Microbiological Quality
	NSW Health Response Protocol - Treatment Failure, Cryptosporidium and Giardia
Physical and chemical contamination	NSW Health Response Protocol - Management of Physical and Chemical Quality
Cyanobacterial (Blue-green algae) bloom/ toxins	Regional Algal Coordinating Committee Contingency Plans NSW Water Directorate Blue Green Algae Management Protocols
Fluoride incident	*New South Wales Code of Practice for Fluoridation of Public Water Supplies*
Business interruption	*NSW Water Directorate Business Continuity Management Guidelines* Section 10.3 and Appendix C - Fluoridation Incident Management: Forms 5 and 6
CCP exceedance	Framework Element 3, 4, 10 and ADWG Chapter 9.9
Public Health Incidents	NSW Benchmarking Reports and Utility TBL Performance Reports

NSW Health Response Protocols are available at http://www.health.nsw.gov.au/environment/water/Pages/drinking-water.aspx

Table 3-9. Emergency Contacts.

Emergency Services	Other organisations	Other
Police, Fire and Rescue, Ambulance Rural Fire Service (local brigade) SES (local unit or 132500)	NSW Health local Public Health Unit NSW Health laboratories and other laboratories NSW Office of Water, Water and Sewerage Inspectors NSW Office of Environment and Heritage and Environment Protection Authority Electricity utility control centre WorkCover Catchment Management Authority NSW Trade and Investment	Media (each local newspaper, TV radio station) Telecommunication service provider control room (Telstra, Optus, Vodafone etc) Staff internal to the water supplier (media, executive, managers etc.)

The contact list must be controlled and currency maintained. It must have a review date and responsibility for review assigned on the document or file.

Communication with the Public

Most water suppliers have a formal media communication policy. The water supplier should ensure this information is included in the incident and emergency response plan and communicated to staff so employees are aware of their obligations. Example boil water alerts and other information can be found on the NSW Health website:
http://www.health.nsw.gov.au/environment/water/Pages/drinking-water.aspx

Further Work

Employees should be trained in emergency response to ensure that they can manage any potential incidents or emergencies effectively. Training on the incident and emergency response plan will help familiarise staff with procedures and determine what works and what does not so that revisions can be made accordingly.

3.7 Element 7: Employee Awareness and Training

The successful operation of a water supply system rests not just on the engineered components but also on the knowledge, skills, motivation and commitment of all involved in the operation of the water supply system from catchment through to tap. This element therefore involves both water quality awareness and training requirements.

What needs to be done:

- In the DWMS document record the management, review and record keeping processes for staff training.
- Reference to the management of training, including records kept and the review processes in place, should be made in the DWMS document.
- The DWMS document must include how the water supplier maintains and improves employees' and contractors' awareness of water quality issues.

The Human Resources section of the water supplier usually manages training requirements and records, including:

- Organisational structure.
- Position descriptions (including reporting responsibilities – see Element 10, Section 3.10 of this document).
- Skills matrix.
- Training records (e.g. certificates and records of attendance).
- Skill currency and requirement for retraining.

Reference to these systems including the records kept and the review processes should be made in the DWMS document.

The water supplier must also ensure that contractors meet the requirements of this element. Induction is one of the initial steps a water supplier can take in informing staff and contractors of water quality awareness. A good induction package should include a simple assessment to ensure that the reader of the materials has not only read the information, but also understands the content and the implications.

All water treatment plant operators must be suitably qualified.

Employee Awareness

The DWMS must record how the water supplier improves and maintains employees' awareness of water quality issues. Mechanisms for raising awareness include:

- 'Toolbox' meeting plan and minutes.
- Regional Organisations of Councils and Alliance workshops and training.
- NSW Health workshops.
- Fluoridation Course.
- NOW training courses and update seminars.
- Conferences and publications by industry bodies for example Water Directorate, Australian Water Association, Water Industry Operators Association, and Local Government NSW.
- Contractor management policies.

Qualifications

The operator in charge of each water treatment works needs to have suitable qualifications and skills. A NSW Office of Water Operator Certificate is a suitable qualification:

Operators who successfully complete the NSW Office of Water's Part 1 and Part 2 Water Treatment Operator training courses since 2010 are issued with a nationally recognised Certificate III qualification by NSW TAFE – Water Treatment Operator.

Operators who have successfully completed the NSW Office of Water's Part 1 and Part 2 courses on or before 2009 have been issued with an Office of Water Certificate – Water Treatment Operator – such operators are qualified to operate any water treatment works in regional NSW.

Operators who successfully complete the NSW Office of Water's Part 1 course are issued with an Office of Water Certificate – Chemical Dosing Systems – such operators are qualified to operate chemical dosing systems, including a chlorinator/aerator and to assist in the operation of a water treatment works. The operator in charge of a chlorinator also needs to complete a supplementary chlorinator safety training course.

Further information on the NSW Office of Water training courses is available at http://www.water.nsw.gov.au/Urban-water/Country-Towns-Program/Technical-support/Training-courses/Training-courses

The operator training courses include comprehensive on-site testing of the operator at their treatment works. Operators must update their training and skills at least every 3 years. Operator update seminars are conducted by the Office of Water for this purpose.

A water treatment works operator with a Certificate III in Water Operations is considered to be suitably qualified to operate a water treatment works if they have completed at least 9 of the 11 units in the above NSW Office of Water course.

Fluoridation

The Fluoride Code requires fluoridation plant operators to hold a NSW Health Fluoride Plant Operator's Certificate. See the Fluoride Code for more information (12. Operator Training and Qualification), at http://www.health.nsw.gov.au/environment/water/Documents/code-of-practice.pdf

3.8 Element 8: Community Involvement and Awareness

It is important that the water supplier consults with its consumers/community, to ensure that water quality decisions are aligned, wherever possible, with the community's desired outcomes.

What needs to be done:

- The water supplier must record in the DWMS document how it engages with the community on drinking water quality issues and takes the community's and consumers' objectives into account when managing the water supply system.

Community Consultation

The ADWG recommend community consultation for the establishment of levels of service, costs, existing water quality problems and the options for protection and improvement of drinking water quality, including constraints on land use and changes in treatment or infrastructure. In NSW utilities may be required to engage with their communities through the following:

- Strategic Business Planning requires regular consultation with the community in the preparation of the business plan and the proposed levels of service.
- Integrated Water Cycle Management (IWCM) Strategy development which requires the community to be involved from the inception of an IWCM study.

Strategic Business Planning and an Integrated Water Cycle Management (IWCM) Strategy are requirements of the *Best Practice Management of Water and Sewerage Guidelines 2007.* At the time of writing, the NSW Water and *Sewerage Community Involvement Guidelines* were being finalised by the NSW *Office of Water.* The finalised Guidelines should be consulted.

The International Association for Public Participation (IAP2) provides information and tools for community engagement including a spectrum of engagement and a toolbox outlining different engagement tools. See http://www.iap2.org/.

Chapter 3.8.2 of the ADWG provides methods for coordinating and disseminating information for community education. Social media is also increasingly being used as a communication and engagement tool by water suppliers. Table lists areas in which suppliers can engage with their community. The DWMS document should state the water supplier's community engagement program.

Community Education

In water supplies/schemes where non potable water is supplied (e.g. raw or recycled water systems) it is important to have an active education program ensuring consumers understand the quality difference between the two systems and encourage them to check for cross connections on their property. Water suppliers must also ensure they comply with the plumbing and signage requirements of AS/NZS 3500.

Community Communication Protocols

Water utilities should consider the various situations that may impact on the community. Protocols should be developed for communicating with all sectors of the community during these situations. Plan the practicality of ensuring that the community is effectively informed, for example contingencies for door knocking, signage and preworded advice notices

Consumer Feedback and Water Quality Complaints

A call centre provides the opportunity for a community to provide feedback. Informal feedback regarding water quality also occurs, particularly in smaller communities. It is important that employees are trained to document this information. Water quality complaints and other consumer feedback must be tracked as they are required indicators for the NSW Performance Reporting form (NSW Office of Water). A water quality complaint refers to an 'expression of dissatisfaction' made to

the organisation (AS ISO 10002-2006). Utilities need to carefully report complaints on this basis. Customer queries or any 'other customer feedback' where the customer 'is not dissatisfied' must be documented separately as 'other consumer feedback' and excluded from the record of 'water quality complaints'.

Social media comments should also be tracked as a source of feedback.

Any water supply that operates a dual water supply reticulation system should take complaints regarding water quality very seriously and consider the potential for cross connection when prioritising calls. Dual water supplies include those providing recycled and or nonpotable water in conjunction with potable water. Water suppliers operating non-potable systems must ensure that all potential consumers are informed that the supply is nonpotable. The local Public Health Unit can provide further information.

Table 3-10. Areas of community engagement and education.

Topics	Program / Information Source
Conservation	Savewater alliance Water week 'We all use water' School programs
Catchment Protection	Landcare drumMUSTER / ChemCollect Weed management IWCM
Water Quality / Levels of Service	Water bill notice IWCM SBP School programs
Compliance	Trade waste program / backflow prevention

3.9 Element 9: Research and Development

The purpose of this element is to understand the water quality issues or factors associated with continual improvement in the delivery of a safe, quality water supply. Validation of processes and design of equipment, investigative studies and research monitoring can all contribute to the requirement of this element.

What needs to be done:

- Review Risk Assessment outcomes for actions to investigate water quality or improve knowledge of the system.
- In the DWMS document, record all water quality investigations in which the water supplier is involved.
- In the DWMS document, record the processes for equipment and plant validation.
- Confirm the disinfection C.t where chlorine / chloramine is used as the primary disinfectant.

Investigative Programs

Water suppliers may conduct investigative programs to better understand and characterise their system. These programs must be planned in consultation with the local Public Health Unit and the NSW Office of Water who can provide advice. Programs may include targeted reticulation monitoring programs and source water monitoring. Project monitoring may be available through NSW Health.

Validation of Processes

To ensure that water treatment works are fit for purpose, robust and cost-effective, a water utility proposal to construct or modify a water treatment works requires the NSW Office of Water's approval under section 60 of the *Local Government Act 1993* (NSW). The Office of Water may also direct corrective actions to be undertaken under Section 61 of the *Local Government Act.* These actions should be carried out after consultation with the local Public Health Unit and NSW Office of Water.

ADWG Section 9.8 provides advice on validation of barrier performance. As part of the risk assessment or in this section the C.t (before the first consumer) should be calculated if chlorine or chloramine is used for disinfection. NOW and the local Public Health Unit can provide advice on validating barrier performance.

3.10 Element 10: Documentation and Reporting

Managing documents and records is essential to ensure that all information relevant to the water supply system can be stored effectively and retrieved as required as well as ensuring that all participants in the water supply system are operating from the most current of procedures, rules and standards.

What needs to be done:

- Record in the DWMS document the record keeping procedures and systems to be used by the water supplier.
- Record how monitoring results (operational monitoring, incidents and emergencies and water quality review) and responses are to be reported to management and external parties.

Documentation

Local water utilities have a range of obligations for record keeping. Examples are provided in Table 3-11.

Water suppliers manage their records through a range of systems (Table 3-12). Suppliers must ensure that information is recorded and maintained in a way that provides easy access for reporting requirements for example NSW Performance Monitoring System, see NSW Benchmarking Reports at http://www.water.nsw.gov.au/Urban-water/Country-Towns-Program/Best-practice-management/Performance-monitoring/Performance-monitoring/default.aspx.

Water suppliers must record how they maintain the currency of information including referring to the NSW Health website for the most recent documents and protocols.

The DWMS document should reference these systems.

Fluoridation

For information on documentation and reporting requirements, see the Fluoride Code (11. Reporting Requirements, 13. Record Keeping and Availability).

Table 3-11. Data management obligations.

Obligation	Information
State Records Act 1998 (NSW)	Councils, County Councils and bodies classified as a public office have record keeping obligations. See: Part 2-records management responsibilities of public offices.
New South Wales Code of Practice for Fluoridation of Public Water Supplies	A water supplier fluoridating its supply must, for two years, maintain daily records including: ■ The volume of water treated. ■ The quantity of fluoridating agent added over the same time period. ■ The corresponding average calculated fluoride dose. ■ The fluoride analysis result from the treated water sample taken during this time period. ■ The stock of fluoridating agent on hand. The records may be in electronic or hardcopy form.
NSW Performance Monitoring System	Annual reporting of water supply and sewerage system performance, including drinking water quality and complaints, required under the NSW Best-Practice Management Framework and the National Water Initiative. Independent auditing of reported data is required for the larger local water utilities which are reported in the annual National Performance Report for Urban Water Utilities. See www.nwc.gov.au
Organisation's governance policy	As documented in the policy.

Table 3-12. Types of water supplier records.

Source	Information Held
Council/water supplier record management system / quality management system	Correspondence, reports
Laboratory Information Management System	Water quality data
NSW Drinking Water Database	Drinking water quality data
Water supplier water quality database	Water quality data
Asset Management System	Asset condition and replacement schedule
Geographic Information System (GIS)	Asset types, characteristics including locations
Accident and incident register	Environmental spills and water quality incidents
Consumer request management system	Consumer issues
Operator log books	Daily operational data and activities
Contractor reports	Specialist contractor reports e.g. reservoir inspections
All staff must be trained in keeping records. This should be documented as part of Element 7.	

Further Work

Operational data should be stored in a format where it can be reviewed and accessed. Physical testing and operational monitoring information should be stored electronically in a spreadsheet or water quality database (even if it is collected in log sheets and log books). Electronic storage allows the information to be backed up and reviewed by others. For example, raw water quality may be logged daily on a paper sheet as part of the operator's duties, but this information is also essential for the water quality risk assessment (Element 2) and providing information for treatment upgrades.

Data collection or testing records should include, either by signature or if electronic by name, who took the reading or measurement.

Operational documents should have a formal schedule for review. The document should have a version control to make sure everyone using the document has the latest version. The most important areas for documentation review are:

- Emergency contact lists. These should be reviewed every three months
- CCP procedures for operation and monitoring. These should be regularly updated to reflect what the operators are doing (if the changes are appropriate).

Regular review of documentation ensures the retention of corporate memory. This is especially important for water suppliers which have difficulty retaining staff and those with an ageing workforce.

Reporting

Clear reporting is an essential component of communication. Reporting responsibilities should be included in job descriptions and procedures. Types of reporting include:

- Line management reporting of monitoring results (Element 3, 4, 5 and 9) and documented responses to noted issues (Element 12).
- Reporting of incidents and emergency response (Element 6, see Table 3-8).
- Water quality reviews (Element 2, 11) and documented responses to noted issues (Element 12).

Examples of external reporting required in NSW are shown in Table 3-13.

Further Work

The water supplier may consider providing relevant water quality information to the community, which can be evaluated through the community consultation program (Element 8). This could be in the form of a publicly available, annual water quality report, for example NSW Water Supply and Sewerage Benchmarking Reports.

Table 3-13. External reporting of water quality performance in NSW.

Item	Aspect
NSW Water Supply and Sewerage Performance Monitoring Reports	Drinking water quality management aspects. Drinking water quality compliance. NSW Best-Practice Framework: IWCM implementation – specifically in relation to water supply.
NSW Water Supply and Sewerage Benchmarking Reports	Categorisation of water supply public health incidents.
NSW Drinking Water Database	Water quality results and statistical summaries.
NSW Coded Practice for Fluoridation of Public Water Supplies	Fluoride Communication Protocol should be used for routine reporting and communication.
NSW Water Supply and Sewerage Strategic Business Planning Guidelines	Utilities are required to report on the implementation of recommendations by NSW Office of Water with regard to section 61 of the Local Government Act 1993 (NSW).

3.11 Element 11: Evaluation and Audit

Systematic assessment of a water supply's drinking water quality results, including auditing how drinking water quality is being managed, is important in determining how effective current management practices are and whether new strategies and measures need to be considered. Fundamental to this overall process is an understanding of how a water supply rates in terms of identified standards and guidelines, and facilitates the setting of benchmarks in relation to similar supplies and circumstances.

What needs to be done:

- Record the processes by which the water supplier undertakes long-term evaluation of its water quality data and records actions for whether improvements are required in the DWMS document.
- The water supplier should record how it satisfies the internal and external auditing requirements of this element including a schedule for internal and external audits.

Long Term Evaluation of Results

The water supplier should review data on how well its system is performing. This evaluation should be undertaken prior to the annual review of the improvement plan (see Element 12), annual budgeting process and the strategic planning process. As a minimum review the following areas:

- Performance of critical control points.
- Water quality data (raw, treated and distribution water quality including the NSW Drinking Water Database).
- Levels of service (including consumer complaints).

Review should be against the Design Report Requirements, ADWG, levels of service, NSW Water Supply and Sewerage Performance Monitoring Reports and other regulatory requirements (Element 1). Shortcomings should be captured in the Improvement Plan (Element 12) and budgeting process.

Audit of the Drinking Water Management System

Water suppliers should establish a system of internal and external audit. Internal audits can be carried out on a frequency determined by the water supplier.

Internal audits should initially focus on:

- Implementation of CCPs and documented response including the investigative follow-up to any exceedances.

- Progress of implementation of improvements and actions (Element 12).
- Record keeping of day-to-day monitoring.
- Data required for the NSW Performance Monitoring System.
- Compliance with the Fluoridation Act, Regulation, and Code of Practice.

External Audits

The frequency of external audit of the DWMS should be determined in consultation with the local Public Health Unit. Audits must be carried out by an independent auditor approved by NSW Health. The auditor must consider all relevant records including NOW and Public Health Unit inspections or reports.

Regardless of the audits commissioned by the water supplier, NSW Health has the authority to commission a comprehensive reviewof any water supplier's Drinking Water Management System.

NOW inspectors and local Public Health Unit Environmental Health Officers may undertake external checks of aspects of the DWMS and keep records of these checks, for example whether Critical Control Points are implemented correctly. Corrective actions may need to be carried out under section 61(1)(b) of the *Local Government Act 1993* or the *Public Health Act 2010*.

Local water utilities with over 10,000 connected properties must arrange auditing of their core performance indicators in accordance with the auditing requirements of the National Performance Framework. This Framework also requires utilities to report whether their risk-based drinking water management plan was externally assessed (i.e. audited).

When reporting on performance for the 2013-14 financial year and thereafter, a water utility will only be able to report 'Yes' to having a risk based Drinking Water Quality Management Plan if it has prepared and implemented a DWMS in accordance with these Guidelines.

3.12 Element 12: Review and Continual Improvement

Review by the senior executive is fundamental to continually improving water quality and consistently delivering a safe, quality water supply. Essential to this commitment is the need to assign resources to ensure the delivery and continual improvement of water supply services from a quality and safety perspective.

What needs to be done:

- Water suppliers should review the effectiveness of the management system and its implementation, at least annually, to ensure that it maintains currency with the drinking water supply. A record of this review should be kept.
- A complete review of all management systems should occur every four years in line with the review of the Strategic Business Plan.
- The scheduled dates for these reviews should be included in the DWMS document.

Keeping the DWMS Current and Senior Executive Review

Water suppliers should regularly review the effectiveness of the DWMS and its implementation, at least annually, to ensure that it maintains currency with the drinking water supply. A record of this review should be kept.

Where significant changes to the water supply/scheme are proposed, a review of the relevant areas of the management system should occur, for example for a proposed operating rule change, undertake a risk assessment and review CCPs.

Reviews of the effectiveness of the drinking water management systems can be undertaken through the mechanisms shown in Table 3-14. It is important that records are kept to show that a senior executive review has been undertaken and that water quality specific issues have been communicated and followed up for action.

Table 3-14. Information that can be used to help fulfil senior executive review requirements.

Source	Information Reviewed	Documentation
Water Quality Reports to Council	Water quality exceedances Water quality incidents CCP exceedances Consumer Information Requests and water quality complaints	Minutes of Council Meeting and Senior Executive Team Meetings.
Review of effectiveness of Drinking Water Management System	Report on the review and whether improvements are warranted	Report on findings and recommendations of the review
Strategic Business Plan	Capital Improvement Program Operational Expenditure Asset Management Plan	Adopted SBP, evidence of progress in implementing the adopted SBP. Best practice audits.
Investigative Studies	Options for water quality improvements	Reports of the investigation and documentation that they had been communicated to senior management.
NSW Water Supply and Sewerage Performance Monitoring Reports	Utility TBL Report and Action Plan template provided by NOW	Utility TBL Report provides a summary of physical, chemical and microbiological compliance, public health incidents and water quality complaints for the previous financial year. This report is retrospective, providing an annual performance review by the water utility. Microbiological and chemical water quality compliance are a high priority for ensuring public health protection. The utility's annual Action Plan must report all failure to achieve microbiological compliance, 'boil water' alerts, the corrective action implemented and whether it was successful.

Continuous Improvement Plan

A drinking water quality management Improvement Plan documents any actions required to improve water quality. Details for each action should include:

- Who is responsible
- Date for completion
- Progress reporting

Progress against the Improvement Plan should be reviewed on a monthly basis. The actions within the plan should be reviewed as part of the budgeting and strategic planning process. Progress against the Improvement Plan will be a key area of auditing focus.

Developing an Improvement Plan

Actions can be identified from a range of sources:

- Areas of improvement identified when developing or reviewing the drinking water management system, including:
- Actions from the Risk Assessment (Element 2 and 3).
- The water supplier's Continuous Improvement System.
- *Local Government Act 1993* (NSW) section 61(1)(b) Directions.
- Areas of improvement identified when developing or reviewing the drinking water management system.
- Water quality actions from the water utility's Annual Action Plan to Council, following its review of its annual Water utility TBL Performance Report and Asset Management Plan required by the NSW *Best-Practice Management of Water Supply and Sewerage Framework*.

Guidance on development of Improvement Plans is available in the example DWMS documents at http://www.health.nsw.gov.au/environment/water/Pages/drinkwater-nsw.aspx

SECTION 4

References and Further Reading

- ADWG (2011) NHMRC/NRMMC (National Health and Medical Research Council/ Natural Resource Management Ministerial Council) *Australian Drinking Water Guidelines* (ADWG) National Water Quality Management Strategy. ISBN Online: 1864965118 http://www.nhmrc.gov.au/guidelines/publications/eh52
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