

Department of Health

health

# Victorian framework for water treatment operator competencies

Best practice guidelines

A joint initiative of the Department of Health  
and the Victorian Water Industry Association

## Foreword

Victoria's *Safe Drinking Water Act 2003* and *Safe Drinking Water Regulations 2005* provide a comprehensive regulatory framework that encompasses a catchment-to-tap, risk-based approach to the management of drinking water quality across the state. The key objectives of this regulatory framework are to ensure that:

- where water is supplied as drinking water it is safe to drink
- any water not intended to be drinking water cannot be mistaken for drinking water
- water quality information is disclosed to consumers and is open to public accountability.

A key aspect of the risk-based approach to the production of safe drinking water is the use of multiple water treatment processes (the so-called 'multiple barrier approach'). The correct operation of these treatment processes is a highly skilled task, requiring constant vigilance and attention to detail.

On a day-to-day basis, it is the water treatment operator who carries the responsibility for ensuring that raw water is treated to the required standard, that incidents that may compromise quality are detected and addressed, and that identified risks are adequately managed. The actions taken, or not taken, by a water treatment operator can have a direct impact on the health and wellbeing of the communities for which they undertake water treatment services.

In recognition of the importance that the training, experience and competence of water treatment operators has on the production of safe drinking water, these best practice guidelines (the guidelines), as agreed to by the Department of Health and members of the Victorian Water Industry Association (VicWater), define the minimum training, qualification and competency standards that operators must attain and maintain in order to operate drinking water treatment facilities in the State of Victoria.



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# Introduction

These guidelines have been produced to recognise the important role that water treatment operators have in the production of safe drinking water.

In order to fulfil their roles effectively, water treatment operators need to undertake appropriate training and skills development on the water treatment processes for which they have responsibility. They also need to gain on the job experience to develop competence, have an appreciation of risk management principles which underpin the operation water treatment systems and undertake ongoing skill development to maintain their competence, as water treatment technology advances.

The required competencies are based on a water supply system public health (microbial) risk classification, in recognition that microbial hazards pose the greatest risk to public health (Hrudey & Hrudey 2004).

The purpose of the guidelines is to provide a minimum competency framework for those directly involved in water treatment activities.

As described in Part seven, compliance with the guidelines will assist VicWater members to demonstrate compliance with their obligation to prepare and comply with a risk management plan under the *Safe Drinking Water Act 2003*.

# Structure of best practice guidelines

The best practice guidelines comprise of five parts:

1. Assessment of the level of microbial risk associated with individual water supply systems
2. Prescription of the minimum levels of competence required to work at individual water treatment facilities, based on the level of microbial risk
3. A gap analysis that details how closely a water business meets the requirements of the guidelines
4. Ongoing training, skills development and certification
5. Assessment of the capability of the water treatment processes at individual water treatment facilities to manage identified microbial risks

# Part one - Water supply system public health (microbial) risk classification

The first part of the guidelines requires water businesses to undertake a water supply system public health (microbial) risk classification for each of their water supply systems.

The rationale for doing this is that the greatest public health risk associated with drinking water supplies arises from microbial pathogens in the source water.

In general, the greater the microbial risk the more technologically-complex the water treatment facility needs to be to manage the risk, and therefore, the greater the skill set the water treatment operator needs to adequately operate the facility. A serious risk arises where an operator is not fully competent in the operation of the water treatment processes for which they are responsible, particularly in the case where a high level of microbial risk is present.

The classification is undertaken using a relatively simple point scoring system (see Appendix A). The majority of the information required to undertake the classification will have previously been collected and assessed as part of the risk management plans required under the Safe Drinking Water Act.

The overall score is calculated by adding up the individual points and expressing the sum as a percentage of the total possible score. The microbial risk classification for the water treatment facility is then made based on the classification scheme detailed in Table 1.

**Table 1: Microbial risk classifications arising from water supply system public health (microbial) risk classification**

| Score         | Microbial risk classification |
|---------------|-------------------------------|
| ≥70%          | Level 4                       |
| ≥50% and <70% | Level 3                       |
| <50%          | Level 2                       |

## Action 1

Under these best practice guidelines, VicWater members undertaking water treatment activities for the purpose of supplying drinking water to the public agree to undertake a water supply system public health (microbial) risk classification on each water supply system that they either operate directly, or have responsibility for, using the template and scoring system at Appendix A of the guidelines, and then provide to the Department of Health the microbial risk classification for each system.

## Part two - Minimum levels of competence

Part two of the guidelines specifies the minimum levels of competence that are required for water treatment operators who undertake water treatment activities at water treatment facilities within a classified water supply system.

The required minimum competencies for the responsible person at a water treatment facility are detailed in Table 2. The responsible person is the staff member who has day-to-day operational responsibility for a particular water treatment facility.

The qualifications are those detailed in the National Water Training Package (versions NWP01, NWP07 or later), which is administered by Government Skills Australia.

In addition, at treatment facilities which are part of Level 3 or Level 4 water supply systems, the responsible person must also be independently assessed as being competent by being certified as an operator under the Water Industry Operators Association of Australia's (WIOA's) Operator Certification Scheme, or by being certified under any other Department of Health-approved certification scheme.

**Table 2: Minimum qualifications, experience and refresher training requirements for the responsible person at water treatment facilities within classified water supply systems**

| Microbial risk classification | Minimum qualifications <sup>^</sup>  | Experience   | Refresher training   |
|-------------------------------|--|--|--|
| Level 4                       | Certificate IV (technical) in Water Operations (NWP01, NWP07 or later) <sup>#</sup><br>Must also be certified <sup>~</sup> | Two years responsibility for a Level 3 facility  | Refresher training required, plus a mandatory safe drinking water issues update course, during every three-year period |
| Level 3                       | Certificate III in Water Operations (NWP01, NWP07 or later) <sup>#</sup><br>Must also be certified <sup>~</sup>            | Two years responsibility for a Level 2 facility or above, or two years assisting in the operation of at a Level 3 facility | Refresher training required, plus a mandatory safe drinking water issues update course, during every three-year period |
| Level 2                       | Certificate II in Water Operations (NWP01, NWP07 or later) <sup>#</sup>  | At least nine months in a water treatment or water quality role  | Refresher training required  |

<sup>^</sup> Minimum qualifications required for the responsible person for the water treatment facility

<sup>#</sup> The units undertaken to gain each certificate must be relevant to water treatment, as well as being appropriate for the treatment process used at the water treatment facility

Units gained under the NWP01, NWP07 or later training packages are considered acceptable for meeting the qualification requirements

For those responsible persons who hold a tertiary qualification they would only need to complete the units that relate to the water treatment processes for which they are responsible

<sup>~</sup> Either via being a certified operator under the Operator Certification Scheme as administered by WIOA, or being certified under any other Department of Health-approved certification scheme.

## Requirements for the responsible person

As detailed above, the responsible person is the staff member who has day-to-day operational responsibility for a particular water treatment facility within a classified water supply system. The responsible person may have responsibility for more than one assessed water treatment facility at any one time, but to do this they need to meet the minimum qualifications, experience and ongoing training requirements that are detailed in Table 2 for all the water treatment facilities for which they are concurrently responsible.

The responsible person should only be responsible for the number of assessed facilities that they can reasonably manage at any one time. The responsible person must spend an appropriate amount of time per week on site at each of the assessed facilities for which they have responsibility. The appropriate amount of time is defined as spending sufficient time at the water treatment facility in order to be able to detect and diagnose any operational problems and deficiencies in the operation of the facility, and then investigate and implement solutions for these problems and deficiencies in a timely manner to ensure the ongoing production of safe drinking water.

There may be more than one responsible person for each assessed water treatment facility to account for illness, holidays or unavailability. If this is the case, it must be clear who within the water business' management structure the responsible person is at any one time.

In the specific cases of out-of-hours callouts or emergency situations it may not always be possible to have a suitably qualified responsible person attend the water treatment facility in the first instance. If this is the case, the callout or emergency at the water treatment facility is to be managed, but the water business needs to ensure that the attending operator has access to appropriately skilled staff if and when required.

The responsible person may be vocationally trained, or hold tertiary qualifications. If the responsible person holds a tertiary qualification, then it is not necessary for them to acquire the relevant certificate under the Water Training Package. However they will be required to undertake relevant units from this training package that relate to the water treatment processes they are responsible for, unless

they can obtain recognition of prior learning, or recognition of current competence, for applicable unit processes from a registered training organisation (RTO).

The responsible person must also be signed off as being competent by a suitably-qualified person. A suitably-qualified person is defined as someone who has sufficient relevant theoretical experience and/or at least three years operational experience in the unit process such that they are able to assess the competency of others.

Regardless of the certificate level held by the responsible person, an additional requirement is that the responsible person must have also completed, or be in the process of completing, all training units relevant to the individual water treatment process steps undertaken at the facility. For example, for a conventional plant with dissolved air flotation and filtration (DAFF), chloramination and fluoridation, the responsible person, if they do not hold a relevant tertiary qualification, will need to have completed the following units or their equivalent:

- Coagulation and flocculation (NWP347)
- Dissolved air flotation (NWP352)
- Granular media filtration (NWP354)
- Disinfection (NWP268)
- Chloramination (NWP366)
- Fluoridation (NWP276)
- Testing and/or laboratory skills (NWP210 or NWP364).

For those holding a tertiary qualification they would only need to complete the units that relate to the water treatment processes.

The full list of units of competence from NWP07 considered relevant to water treatment operators are listed in Appendix D.

# Requirements for all other water treatment operators working at assessed water treatment facilities

All water treatment operators at assessed water treatment facilities must gain a formal qualification under the Water Training Package (versions NWP01, NWP07 or later).

Water treatment operators who are assisting in the operation of a Level 2 facility must gain within 24 months of being employed, or already have at time of employment, at least a Certificate II qualification in Water Operations. As is the case for the responsible person, the completed units, or the units being undertaken, must be relevant to the individual water treatment process steps undertaken at the facility. Any shortfall in relevant units must be made up within 36 months.

Similarly, water treatment operators who are assisting the responsible person at Level 3 or Level 4 facilities must gain within 24 months of being employed, or already have at time of employment, a Certificate III qualification in Water Operations. As is the case for the responsible person, the completed units, or the units being undertaken, must be relevant to the individual water treatment process steps undertaken at the facility. Any shortfall in relevant units must be made up within 36 months.

(The full list of units of competence from NWP07 that are considered relevant to water treatment operators are listed in Appendix D.)

If the operator holds or acquires a tertiary qualification then it is not necessary for them to acquire the relevant certificate under the Water Training Package. However, they will be required to undertake relevant water treatment units from this training package that relate to the individual water treatment process steps at the assessed facilities at which they work, unless they can obtain recognition of prior learning or recognition of current competence for these unit processes from a RTO.

All staff members must also be signed off as competent by a suitably-qualified person, as defined above.

## General requirements

Additional to the requirements above, within 12 months of first being employed as a water treatment operator at an assessed facility, the operator must undertake training on both the Australian Drinking Water Guidelines and risk management principles. Attendance at a single course, which covers both the Australian Drinking Water Guidelines and risk management, will be sufficient to meet this requirement.

The required content for this training is detailed in Appendix B.

All accredited Water Training Package units must be undertaken at RTOs. The minimum requirements of the guidelines will not be considered as being met until each operator is signed off as competent by both the RTO and the suitably-qualified person.

Once the operator has undertaken the training and gained the qualifications described above at one assessed water treatment facility, the training and qualifications can transfer with the operator to other assessed facilities or other water businesses. The requirement to attain any additional relevant water treatment units relevant to the treatment processes the operator is responsible for, still applies.

Water businesses must ensure that any contractors or third parties that undertake water treatment activities on behalf of the business also meet the minimum requirements of the guidelines.

Water businesses must also undertake planning to ensure that there are suitable arrangements in place to manage such issues as staff leave, staff turnover and staff retirements, to ensure that, where practicable, the requirements of the guidelines are always met. This planning should include some form of succession planning.

## Part three - Assessment of required level of operator competency

To verify that the required level of operator competency is being achieved at each assessed water treatment facility, water businesses are required to assess the degree to which staff at each assessed water treatment facility meet the requirements of the guidelines.

### Action 2

At the time of the submission of the initial water supply system public health (microbial) risk classification assessment to the Department of Health, VicWater members who undertake water treatment for the purpose of supplying drinking water to the public also agree to provide the department with a summary of the competencies and qualifications of the staff at each water treatment facility that the VicWater member operates, including an assessment of where the minimum levels of competency, as described in Part two of the guidelines, are currently not being met.

### Action 3

Where the assessment indicates that the minimum levels of competency are not being met at an assessed water treatment facility, VicWater members agree to provide details of the proposed actions they will take to address this, including proposed timeframes.

## Part four - Ongoing training and skills development

An important aspect of the guidelines is recognition that ongoing training and skills development is vital for ensuring that water treatment operators maintain the required level of competency to deliver safe drinking water. Therefore, there are ongoing training requirements for responsible persons.

The responsible person at a Level 3 or Level 4 water treatment facility must undertake a refresher training program, in addition to attending a mandatory safe drinking water issues update course, during every three-year period.

The responsible person at a Level 2 water treatment facility must also undertake refresher training.

The refresher training program should cover a range of different training, and should include all of the following elements:

- in-house training courses
- independent training courses
- attendance at performance optimisation workshops
- rotation to other water treatment facilities to gain experience in different treatment processes
- attendance at conferences/workshops that have a focus on water treatment or water quality.

The refresher training requirements for the responsible person at a Level 3 or Level 4 water treatment facility may be met by the training requirements detailed in the operator certification scheme under which the responsible person is certified.

Whilst not mandated, it is expected that all water treatment operators at assessed facilities, not just those who are the responsible person, will undergo an appropriate amount of ongoing training to ensure that they remain competent in the tasks that they perform and maintain an awareness of water quality issues.

The training can be undertaken either internally or externally to the water business. In both cases, the training courses must be relevant to water treatment processes, or the operation of water treatment facilities. The training must be conducted by suitably competent trainers (which can include water business staff), and adequate training

records must be kept. A suitably competent trainer is defined as someone who has sufficient relevant theoretical experience and/or at least three years operational experience in the subject matter they are providing training on, so that they are able to adequately train others in the subject matter.

Relevant external training and skill development opportunities may include, but are not limited to:

- undertaking additional relevant units of competence from the Water Training Package or other approved accredited training
- undertaking additional training offered periodically by specialists, universities or colleges
- attendance, or presentation of a paper, at an Australian Water Association annual conference, with attendance focused on the water treatment or water quality streams
- attendance, or presentation of a paper, at an AWA Enviro Conference, with attendance focused on the water treatment or water quality streams
- participation in WIOA specialist workshops, such as those dealing with:
  - filter assessment and operation
  - distribution system management
  - activated carbon use
  - optimisation of coagulation and flocculation
- attendance, or presentation of a paper, at a WIOA operator's conference where water treatment or distribution system management papers are being presented.
- participation in a Water Treatment Alliance (WTA) filter optimisation two-day workshop
- attendance at Water Quality Research Australia water quality workshops or road shows
- completion of internal training courses relevant to water treatment or the operation of water treatment facilities.

Ongoing training or skill development requirements that form part of a Department of Health-approved certification scheme, or a Department of Health-approved training program, count towards meeting the ongoing training requirements detailed in Table 2.

As detailed above, the responsible person at either a Level 3 or Level 4 water treatment facility is required to attend a safe drinking water issues course every three years. This requirement is in addition to the previously stated ongoing training requirements.

The safe drinking water issues course will be a half-day session which will cover new and emerging drinking water quality issues. Course content is likely to vary over time and the course content will be designed in consultation with the Department of Health to ensure relevant emerging issues are reflected in the training.

## Part five - Treatment capability assessment

The risk management framework established under the Safe Drinking Water Act requires water businesses to identify, assess and manage risks to drinking water quality. A treatment capability assessment has been developed to assist water businesses in assessing whether their water treatment facilities have the required treatment capability (preventative measures) to manage the assessed public health microbial risk.

The treatment capability assessment is based on a scoring system that allows water treatment facilities to be categorised based on their capability to manage public health microbial risk (See Appendix D). The overall score is calculated by adding up the individual points and expressing the sum as a percentage of the total possible score. The treatment capability category is based on the scheme detailed in Table 3.

**Table 3: Summary of treatment capability assessment**

| Treatment capability score | Treatment capability category |
|----------------------------|-------------------------------|
| ≥75%                       | Category 4                    |
| ≥50% and <75%              | Category 3                    |
| <50%                       | Category 2                    |

The expected capability of the water treatment facility for each public health microbial risk classification is detailed in Table 4 below.

**Table 4: Summary of expected treatment capability category for each microbial risk classification level**

| Microbial risk classification | Expected treatment capability category |
|-------------------------------|--|
| Level 4                       | Category 4                             |
| Level 3                       | Category 4 or 3                        |
| Level 2                       | Category 4, 3, or 2                    |

### Action 4

Each VicWater member undertaking water treatment for the purpose of supplying drinking water to the public also agrees to undertake a treatment capability assessment on each water treatment facility that they either operate directly, or have responsibility for and then provide to the Department of Health the capability category for each facility.

## Part six - Ongoing review

As the risks that may affect water quality, and the actions taken to manage these risks, are not static, but may change over time, subsequent assessments will be required to ensure the microbial risk classifications, the gap analysis, and the treatment capability categories remain current.

### Action 5

Every three years after the initial microbial risk classification, gap analysis and treatment capability assessment, VicWater members agree to redo the microbial risk classification, gap analysis and treatment capability assessment on each water treatment facility that they operate, or have responsibility for, and provide to the Department of Health the revised results.

## Part seven - Other matters

- Any proposal, by any Department of Health-approved provider of either an operator certification scheme or refresher training to significantly change their certification scheme or refresher training, particularly where the change relates to the financial or certification requirements of the scheme or training, must be approved by both the Department of Health and VicWater.
- The Department of Health may request, through appropriate written notice, as detailed in section 26(3) of the *Safe Drinking Water Act 2003*, that water businesses provide summaries of their activities and level of compliance with the requirements of the guidelines in their annual reports to the department.
- The Department of Health may also include details of the performance of the Victoria water industry against the requirements of the guidelines in its annual report to the Minister for Health.
- Vicwater members are required to prepare and comply with a risk management plan, under sections 7 and 9 of the *Safe Drinking Water Act*. Compliance with the guidelines will assist VicWater members to demonstrate compliance with their obligation to the extent that it relates to risks posed by lack of competency of staff.
- Upon commencement of the guidelines, any actions taken under the guidelines in relation to risk management will be considered to be part of the risk management plan required under *Safe Drinking Water Act*, and is therefore auditable as part of any risk management plan audit under the Act.

## Summary of actions

Under these best practice guidelines, each VicWater member undertaking water treatment for the purpose of supplying drinking water to the public agrees to:

### Action 1

Undertake a public health (microbial) risk classification assessment for each water supply system that they either operate directly, or have responsibility for, using the template and scoring system in Appendix A of the guidelines, and then provide to the Department of Health the microbial risk classification for each assessed system.

### Action 2

At the time of submission of the initial public health (microbial) risk classification to the Department of Health, provide the department with a summary of the competencies and qualifications of the staff at each water treatment facility that they operate, including an assessment of where the minimum levels of competency, as described in Part two of the guidelines, are currently not being met.

### Action 3

Where the assessment indicates that the minimum levels of competency are not being met at an assessed water treatment facility, provide details of the proposed actions they will take to address this, including proposed timeframes.

### Action 4

Undertake a treatment capability assessment on each water treatment facility that they either operate directly, or have responsibility for, and then provide to the Department of Health the treatment capability category for each facility.

### Action 5

Every three years after the initial microbial risk classification, gap analysis and treatment capability assessment, redo the microbial risk classification, gap analysis and treatment capability assessment on each water treatment facility that they operate, or have responsibility for, and provide to the Department of Health the revised results.

## Glossary

**Assessed water treatment facility** – a water treatment facility for which a water supply system public health (microbial) risk classification assessment has been undertaken.

**Classified water treatment system** – a water treatment system where the water treatment facilities have undergone a water supply system public health (microbial) risk classification assessment and been allocated a microbial risk classification.

**Responsible person** - the staff member who has day-to-day operational responsibility for a particular assessed water treatment facility.

**Suitably-qualified person** - someone who has sufficient relevant theoretical experience and/or at least three years operational experience in the unit process such that they are able to assess the competency of others.

**Suitably qualified trainer** - someone who has sufficient relevant theoretical experience and/or at least three years operational experience in the subject matter that they are providing training on, so that they are able to adequately train others in the subject matter

**Water supply system** - the catchment and raw water supply, and the water treatment facility, up to the point where treated water leaves the water treatment facility (it does not include the associated reticulation system).

**Water treatment facility** – a facility whose purpose is to treat water to a drinking water standard. Generally equivalent to a water treatment plant; does not include secondary disinfection points.

## Acronyms and abbreviations

**ADWG** – Australian Drinking Water Guidelines

**AWA** – Australian Water Association

**DH** – Department of Health (Victoria)

**NWP** – National Water Training Package

**RTO** – Registered Training Organisation

**Vicwater** – Victorian Water Industry Association

**WIOA** – Water Industry Operators Association

**WTA** – Water Treatment Alliance

## References

Hrudey, S E & Hrudey, E J 2004, *Safe drinking water: lessons from recent outbreaks in affluent nations* International Water Association Publishing, London, UK.

## Appendix A - Scoring table for water supply system public health (microbial) risk classification assessment

| Item  | Max points | Comments  | Score |
|---|------------|---|-------|
| <b>Raw water sources (rating based on public health significance)</b>   |            |   |       |
| <b>Catchment</b> <ul style="list-style-type: none"> <li>Protected (0 points)</li> <li>Unprotected (60 points)</li> </ul>  | 60         | A fully protected catchment is one where the entire catchment from watershed to water treatment facility. Where this is not the case the catchment is considered to be unprotected.   |       |
| <b>Raw water source</b> <ul style="list-style-type: none"> <li>Seawater/saltwater (0 points) (assumes reverse osmosis treatment)</li> <li>Groundwater (confined aquifer) (0 points)</li> <li>Groundwater (unconfined aquifer) (4 points)</li> <li>Surface water                             <ul style="list-style-type: none"> <li>- Reservoir with greater than 30 days detention time under normal operating conditions (5 Points)</li> <li>- Reservoir with less than 30 days detention time under normal operating conditions (10 Points)</li> <li>- River or stream (30 points)</li> </ul> </li> </ul> | 30         | Surface waters (either reservoirs or river/streams) score more highly than other sources because of the risk of contamination.<br><br>Streams score more highly than reservoirs since there is no holding period for the water. |       |
| <b>Raw water quality</b>  |            |   |       |
| <b>Average raw water quality variation</b> <ul style="list-style-type: none"> <li>Little or no variation (0 points)</li> <li>Minor variations: 'high quality' surface or groundwater source (1 point)</li> <li>Moderate variations: during variations in raw water quality, coagulant dose (or pH adjustment chemicals dose) changes are made monthly (3 points), weekly (4 points), or daily (5 points).</li> </ul>  | 5          | Key issue is the effect that variations of raw water quality have on water treatment processes, particularly where frequent changes are necessary to achieve optimised treatment performance.                                   |       |

| Item   | Max points | Comments   | Score |
|--|------------|--|-------|
| <b>Raw water quality (continued)</b>   |            |  |       |
| <p><b>Rainfall event raw water quality variation</b></p> <ul style="list-style-type: none"> <li>Minor variations: during rainfall events the increase in raw water turbidity is less than 50% of the dry weather figure, or raw water turbidity remains &lt; 25 NTU during rainfall events (10 Points)</li> <li>Moderate variations: during rainfall events the increase in raw water turbidity is between 50% and 100% of the dry weather figure, or the raw water turbidity is between 25 and 100 NTU during rainfall events (20 Points)</li> <li>Severe variations: during rainfall events the increase in raw water turbidity is greater than 100% of the dry weather figure, or raw water turbidity is greater than 100 NTU during rainfall events (30 Points)</li> </ul> | 30         | Rainfall events have been identified as major hazard and significantly increase the risk of pathogen breakthrough.   |       |
| <p><b>Pollutant input to raw water</b></p> <ul style="list-style-type: none"> <li>Raw water source subject to: <ul style="list-style-type: none"> <li>- agricultural or septic tank inputs (20 points)</li> <li>- sewer overflows during rainfall events (15 Points)</li> <li>- Treated effluent from sewage treatment plants (10 points)</li> <li>- Light industrial waste (5 points)</li> <li>- None of the listed inputs (0 points)</li> </ul> </li> </ul>  | 50         | Point source discharge, in particular any source that may be contaminated with faecal material increases the risk to public health.  |       |
| <p><b>Other raw water characteristics critical to treatment process</b></p> <ul style="list-style-type: none"> <li>Presence of taste and/or odour compounds for which treatment process adjustments are routinely made (2 points)</li> <li>Presence of cyanobacteria and possible toxins (4 points)</li> <li>Iron and/or manganese &gt; ADWG limits (4 points)</li> <li>1 point per average mg/L DOC to maximum of 20 mg/L</li> </ul>  | 30         | Various attributes of raw water have an impact on the treatment processes and if not managed may have an adverse impact on the quality of water or on the management of the distribution system. |       |

| Item   | Max points | Comments  | Score |
|--|------------|---|-------|
| <b>Filter ripening period</b>  |            |   |       |
| <ul style="list-style-type: none"> <li>Water produced during filter ripening sent to waste (0 Points)</li> <li>Water produced during filter ripening not sent to waste (5 Points)</li> </ul>   | 5          | Filter ripening (the period immediately after a backwash) is characterised by high turbidity water which in turn represents a risk to consumers.  |       |
| <b>Residuals management</b>  |            |   |       |
| <ul style="list-style-type: none"> <li>Sludge supernatant/backwash water not returned to head of plant (0 points)</li> <li>Sludge supernatant/backwash water treated with ozone or UV and returned to raw water storage (0 points)</li> <li>Clarified and/or settled sludge supernatant/backwash water, treated with ozone or UV, and returned to head of plant <b>prior</b> to coagulation point (5 points)</li> <li>Unsettled and/or untreated sludge supernatant/backwash water returned to head of plant <b>prior</b> to coagulation point (10 points)</li> <li>Unsettled and/or untreated sludge supernatant/backwash water returned to head of plant <b>after</b> coagulation point (30 points)</li> </ul> | 30         | <p>Return of backwash water or sludge supernatant to the head of the plant carries with it a risk of returning viable protozoan pathogens to the influent.</p> <p>Wherever any recycled stream is returned to the head of plant, best practice is that the flow is continuous and less than 5% of inflow and that coagulation dosing is flow paced and includes an allowance for changes in flow.</p> |       |

The microbial risk classification is calculated by adding the individual points and expressing them as a percentage of the total possible points (240). The level for the water treatment facility is then based on the table below.

**Microbial risk classifications arising from water supply system public health (microbial) risk classification**

| Raw score (absolute) | Raw score (percentage) | Microbial risk classification |
|----------------------|------------------------|-------------------------------|
| ≥168                 | ≥70%                   | Level 4                       |
| 120-167              | ≥50% and <70%          | Level 3                       |
| ≤119                 | <50%                   | Level 2                       |

# Appendix B - Required content for Australian Drinking Water Guidelines and risk management principles course

The minimum required content for the Australian Drinking Water Guidelines and risk management principles course are as follows:

- Overview of risk management and risk management principles.
- The nature of hazards and hazardous events encountered in water quality management.
- Overview of the Australian Drinking Water Guidelines.
- Overview of the risk management framework which is detailed in Chapters 2 and 3 of the Australian Drinking Water Guidelines, including:
  - reference to the 12 elements of the framework, plus a brief description of each element
  - a linking of the 12 elements to the day-to-day activities of water treatment operators
  - the concepts of critical control points target objectives, process monitoring and operating procedures.
- Examples of water quality incidents where failure to follow acceptable procedures has lead to outbreaks of waterborne disease.

## Appendix C - Scoring table for treatment capability assessment

| Item  | Max points |
|---|------------|
| <b>Rain water</b>   |            |
| <ul style="list-style-type: none"> <li>On line turbidity monitoring of raw water (4 points)</li> <li>Formal calibration system for raw water turbidity meters (2 points)</li> <li>Alternative raw water sources available and selected based on relative pathogen risk (2 points)</li> </ul>  | 8          |
| <b>Treatment chemical addition</b>  |            |
| <ul style="list-style-type: none"> <li>Process to control pH of coagulation (4 Points)</li> <li>On line monitoring of coagulation pH (4 points)</li> <li>Dedicated mixing system for mixing of primary coagulants (4 points)</li> <li>Automatic duty standby dosing pumps for primary coagulants and polymeric aids (4 points)</li> <li>Alternative dosing points available for primary coagulant and polymeric aids (2 points)</li> <li>Volumetric draw down tubes or other physical system to verify actual dose (4 points)</li> <li>Where the raw water source is a river or stream, automated adjustment of coagulant dose occurs (streaming current detector, zeta potential meter, 'Compass', other) (4 points)</li> <li>Dosing monitored through mass flow meters, load cells or tank levels to provide alarms on failure of dosing (2 points)</li> <li>Residual aluminium (for alum dosing) or iron (for iron salt dosing) monitored to optimise coagulant dosing (2 points)</li> </ul> | 30         |
| <b>Clarification/sedimentation</b>  |            |
| <ul style="list-style-type: none"> <li>Flocculation flexibility available (variable contact time, multiple compartments, adjustable flocculator speeds) (4 points)</li> <li>On line turbidity monitoring of settled/floated water turbidity (4 points)</li> <li>Formal calibration system for clarified water turbidity meters (2 points)</li> <li>Clarification system operated at &lt; 80% of current design flow rate (8 points)</li> <li>Clarification system operated at 80-99% of current design flow rate (4 points)</li> <li>Clarification system operated at &gt;= 100% of current design flow rate (0 points)</li> </ul>  | 18         |
| <b>Filtration</b>   |            |
| <ul style="list-style-type: none"> <li>Dual media filters (8 points)</li> <li>Shallow bed mono media filters (6 points)</li> <li>Deep bed mono media filters (8 points)</li> <li>Media bed depth (excl support gravels) &gt; 1m (6 points)</li> <li>Media bed depth (excl support gravels) &lt; 1m (3 points)</li> <li>Membrane filtration (10 points)</li> <li>Filters operated at &lt; 80% of current design filtration rate (8 points)</li> <li>Filters operated at 80-99% of current design filtration rate (4 points)</li> <li>Media filters operated at &gt;= 100% of current design filtration rate (0 points)</li> <li>Filter manuals and as constructed drawings are available on site (2 points)</li> </ul>   | 30         |

| Item   | Max points |
|--|------------|
| <b>Filter monitoring</b>   |            |
| <ul style="list-style-type: none"> <li>• On line turbidity monitoring of individual filters (8 points)</li> <li>• Formal calibration program for turbidity meters including records (2 points)</li> <li>• Long term monitoring of filter performance, that consists of reviewing at least 12 months worth of data (4 points)</li> <li>• Formal filter inspections are carried out and recorded at intervals of not greater than 18 months, or after any significant period of elevated turbidity in the raw water, or after a period of poor performance (4 points)</li> <li>• Target and critical objectives have been set for filter function based on WTA, USEPA or other bench marked system (2 points)</li> <li>• Operations manuals or standard operating procedures include details of media and support gravels, filtration rates, air scour and backwash rates (2 points)</li> <li>• Records of adequate fluidisation or expansion of media beds available (4 points)</li> <li>• Technical basis of filter run times established and recorded (2 points)</li> <li>• Technical basis of filter backwash times established and recorded (2 points)</li> <li>• Automatic plant shutdown if critical limit exceeded (4 points)</li> </ul> | 34         |
| <b>Primary disinfection</b>  |            |
| <ul style="list-style-type: none"> <li>• Chlorine or chloramine disinfection (20 points)</li> <li>• UV or ozone disinfection (5 points)</li> <li>• Disinfection targets based on target Ct values. Basis of selection of Ct is documented (4 points)</li> <li>• On line chlorine residual analysers (4 points)</li> <li>• Verified automatic shutdown of flow when chlorination fails (8 points)</li> <li>• Flow paced dosing with no remote monitoring and/or alarms (1 Point)</li> <li>• Flow paced - residual trim chlorine dosing with remote monitoring and/or alarms (4 Points)</li> <li>• Flow paced - chlorine dosing with remote monitoring and/or alarms (3 Points)</li> </ul>   | 45         |
| <b>Control systems</b>   |            |
| <ul style="list-style-type: none"> <li>• Basic SCADA system (2 points)</li> <li>• Advanced SCADA system (trending available at sites other than water treatment facility) (4 points)</li> <li>• Use of SCADA or similar instrumentation systems to provide data, with: <ul style="list-style-type: none"> <li>- monitoring/alarm only, no process operation – plant has no automated shutdown capability (0 points)</li> <li>- limited process operation – e.g. remote shutdown capability (2 point)</li> <li>- moderate process operation – alarms and shutdown, plus partial remote operation of plant (2 points)</li> <li>- extensive or total process operation – alarms and shutdown, full remote operation of plant possible (4 points)</li> </ul> </li> </ul>   | 8          |
| <b>Alarms</b>  |            |
| <ul style="list-style-type: none"> <li>• Alarms for each control point activated and levels based on target objectives and critical limits detailed in risk management plan (8 points)</li> <li>• All alarms enabled and regularly verified (4 points)</li> </ul>  | 12         |

| Item  | Max points |
|---|------------|
| <b>Operator attendance</b>  |            |
| <ul style="list-style-type: none"> <li>• 24/7 (12 points)</li> <li>• Daily (single 8 – 10 hour shift) (8 points)</li> <li>• Daily (&lt; 3 hours /day) (4 points)</li> <li>• Less than daily attendance (1 point)</li> <li>• Unattended (0 point)</li> </ul>   | 12         |
| <b>Plant operation</b>  |            |
| <ul style="list-style-type: none"> <li>• Plant operates irregularly with short on/off periods &lt; 8hrs per day (0 points)</li> <li>• Plant operates continuously for between 8-16 hours per day (4 points)</li> <li>• Plant operates continuously (8 points)</li> </ul>  | 8          |
| <b>Technical support</b>  |            |
| <ul style="list-style-type: none"> <li>• Operational staff have direct access to technical support services who are available to assist in day-to-day operational issues and process problem solving (20 points)</li> <li>• Operational staff have no direct access to technical support services who are available to assist in day-to-day operational issues and process problem solving (0 points)</li> <li>• Active member of WTA or have gone through some other documented external or independent plant optimisation program (8 points)</li> <li>• Formal management system based on ADWG Framework or HACCP (8 points)</li> </ul> | 36         |

The treatment capability category is calculated by adding the individual points and expressing them as a percentage of the total possible points (241). The category for the water treatment facility is based on the table below.

**Summary of treatment capability categories**

| Raw treatment capability score (absolute) | Treatment capability score (percentage) | Treatment capability rating |
|---|---|-----------------------------|
| ≥181                                      | ≥75%                                    | Category 4                  |
| 121-180                                   | ≥50% and <75%                           | Category 3                  |
| ≤120                                      | <50%                                    | Category 2                  |

## Appendix D - Water treatment specific units of competency under NWP07 Water Training Package

| Unit code                   | Unit title   |
|-----------------------------|--|
| <b>Certificate II units</b> |  |
| NWP201B                     | Follow defined OHS procedures and regulatory requirements  |
| NWP202B                     | Apply environmental and licensing procedures   |
| NWP203B                     | Plan and organise personal work activities   |
| NWP207A                     | Work effectively in the water industry   |
| NWP210B                     | Perform basic water quality tests  |
| NWP211B                     | Use computerised systems   |
| NWP215B                     | Install and replace basic volumetric metering equipment  |
| NWP218B                     | Perform and record sampling  |
| NWP219A                     | Work safely in confined spaces   |
| NWP221A                     | Operate basic flow control and regulating devices in water or wastewater treatment network systems |
| NWP234B                     | Locate, identify and protect utility services  |
| NWP245B                     | Maintain tanks and water storage assets  |
| NWP258B                     | Monitor and operate bulkwater transfer systems   |
| NWP259B                     | Operate, monitor and maintain pump stations  |
| NWP260A                     | Monitor and report water treatment processes   |
| NWP261A                     | Operate and maintain water treatment plant and equipment   |
| NWP268B                     | Monitor, operate and report chlorine disinfection systems  |
| NWP271B                     | Monitor, operate and report sedimentation processes  |
| NWP273A                     | Monitor, operate and report ultraviolet irradiation disinfection systems                           |
| NWP274A                     | Monitor, operate and report ozone treatment systems  |
| NWP275A                     | Monitor, operate and report chlorine dioxide systems   |
| NWP276A                     | Monitor, operate and report fluoridation systems   |
| NWP277A                     | Work safely with liquefied chlorine gas  |
| NWP278A                     | Perform blue green algae sampling  |

| Unit code | Unit title |
|-----------|------------|
|-----------|------------|

### Certificate III units

|          |  |
|----------|--|
| NWP300B  | Provide and promote customer service                                       |
| NWP301B  | Implement, monitor and coordinate environmental procedures                 |
| NWP330B  | Establish positions of underground utilities using locating devices        |
| NWP345B  | Monitor, operate and control water treatment processes                     |
| NWP347B  | Monitor, operate and control coagulation and flocculation processes        |
| NWP348B  | Monitor, operate and control sedimentation and clarification processes     |
| NWP352B  | Monitor, operate and control dissolved air flotation processes             |
| NWP354B  | Monitor, operate and control granular media filtration processes           |
| NWP355B  | Monitor, operate and control membrane filtration processes                 |
| NWP356B  | Monitor, operate and control ion exchange processes                        |
| NWP357B  | Monitor, operate and control reverse osmosis and nano filtration processes |
| NWP360B  | Monitor, operate and control dewatering processes                          |
| NNWP363B | Monitor performance and control maintenance of treatment plant assets      |
| NWP364B  | Perform laboratory testing   |
| NWP365A  | Identify and confirm blue green algae outbreaks                            |
| NWP366A  | Monitor, operate and control chloramination disinfection processes         |
| NWP367A  | Monitor, operate and control activated carbon adsorption processes         |
| NWP368A  | Respond to blue green algae incidents                                      |

### Certificate IV units

|          |  |
|----------|--|
| NWP401B  | Coordinate and monitor the application of environmental plans and procedures |
| NWP410B  | Coordinate and monitor asset construction and maintenance                    |
| *NWP426B | Coordinate and monitor the operation of potable water systems                |
| *NWP435B | Coordinate and monitor the optimisation of water treatment processes         |

## Imported units of competency

| Unit code   | Unit title   |
|-------------|--|
| BSBCMN205A  | Use business technology  |
| BSBCMN213A  | Produce simple word-processed documents  |
| BSBCMN214A  | Create and use simple spread sheets  |
| BSBCMN302A  | Organise personal work priorities and development  |
| BSBCMN402A  | Develop work priorities  |
| BSBFLM405B  | Implement operational plan   |
| BSBFLM505B  | Manage operational plan  |
| BSBFLM513A  | Manage budgets and financial plans within the work team  |
| BSBOHS303A  | Contribute to OHS hazard identification and risk assessment  |
| LGACOM405B  | Implement and monitor the organisation's OHS policies, procedures and programs within the work group |
| LGAWORK404A | Manage a civil works project   |
| LGAWORK503A | Undertake project investigation  |

### \*Note:

Government Skills Australia has now implemented a continuous improvement process to ensure that the Water Training Package can be updated to meet changes in technology and systems on an as needs basis. As part of this process, a significant rework of the Certificate IV

water and wastewater treatment units has been undertaken. On completion of the consultation process currently under way, the Certificate IV units marked \* are likely to be replaced by the following units of competence:

| Unit code | Proposed unit title   |
|-----------|---|
| NWP 4??A  | Apply knowledge of chemistry to water industry processes  |
| NWP 4??A  | Contribute to the implementation and continuous improvement of quality systems in the water industry    |
| NWP 4??A  | Investigate and report on optimisation of granular media filtration processes                           |
| NWP 4??A  | Investigate and report on the optimisation of dissolved air flotation processes                         |
| NWP 4??A  | Investigate and report on optimisation of sedimentation and clarification processes                     |
| NWP 4??A  | Investigate and report on the optimisation of chemical addition, coagulation and flocculation processes |
| NWP 4??A  | Select the treatment requirements for waterborne microorganisms   |

In addition, it is recommended that the following two units be added to the list of acceptable imported competency units.

|           |   |
|-----------|---|
| MEM30027A | Prepare basic programs for programmable logic controllers     |
| MCMT461A  | Facilitate SCADA systems in a manufacturing team or work area |

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