

Risk management plan for

# *LEGIONELLA* CONTROL

in the operation and maintenance of the  
water systems of

*Facility name*

Facility name

Facility address

Responsible person

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## Revision history

Revision	Comment	Date	Initials



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## Advisory note

This template has been provided to assist in the development of a risk management plan for *Legionella* control based on the information and processes described in the enHealth *Guidelines for Legionella control in the operation and maintenance of drinking water distribution systems in health and aged care facilities*.

Advisory information has been included in certain sections to assist with the interpretation and completion of relevant plan details. It is expected that this content will be either deleted or replaced with content specific to your facility in your final document.

In the event of complicated plumbing infrastructure, positive *Legionella* test results that are not easily controlled via the implementation of measures within the plan, an outbreak of Legionnaires' disease, or lack of confidence in in-house ability to prepare the plan, external expert assistance should be sought.



# 1 Risk management team

Summary of actions:

- Nominate *Legionella* risk management team members.
- Record why team members have been selected to participate in *Legionella* risk management.
- Clearly articulate the responsibilities of each member of the risk management team.

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**Table 1 Risk management team members**

Name	Organisation	Position	<i>Legionella</i> risk management responsibilities	Skills/knowledge/experience <i>(reasons for being in team)</i>	Contact details

## 2 Risk analysis

Summary of actions:

- Gather information on the water supply system.
- Gather information on the water uses and users within the facility.
- Describe the system (including treatment).
- Discuss the quality of incoming water.
- Identify hazards associated the facility's water supply system.
- Identify existing control measures.
- Perform risk assessment.

### 2.1 System description

Insert a flow diagram/schematic drawing/plan of your facility's system. An example is shown below.

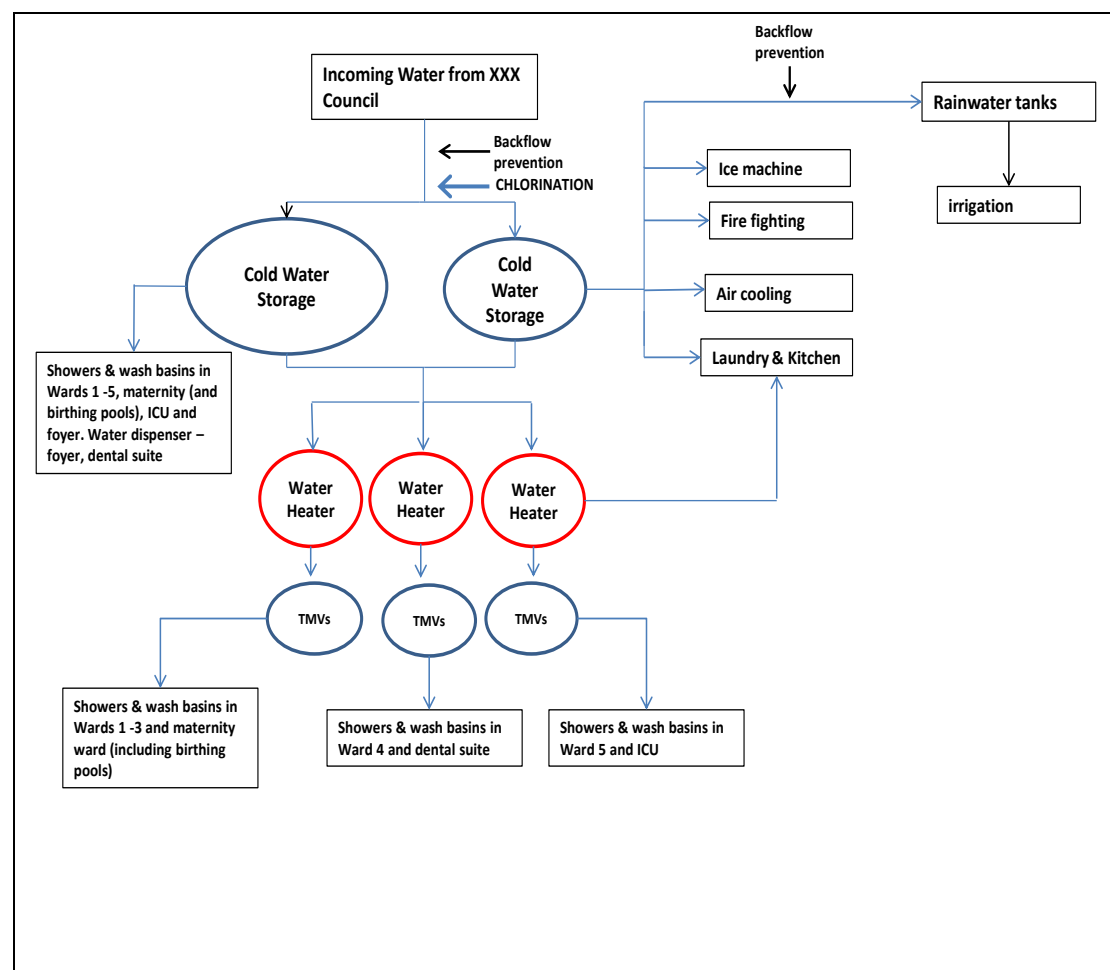


Figure 1 Schematic of *Facility name* water delivery system

### 2.1.1 Uses of water

List uses of water within the facility, for example:

- drinking (includes feed into ice machines and water dispensers)
- clinical uses (e.g. dialysis, hydrotherapy, dental chairs)
- swimming and spa pools
- bathing
- toilet flushing
- laundry
- firefighting and fire suppression (including sprinklers)
- air conditioning
- food preparation (including ice making)
- irrigation of grounds
- birthing pools
- decorative fountains.

### 2.1.2 Users of water

Provide details of water users in the facility, for example:

- facility population/number of beds
- clinical functions (e.g. maternity, intensive care etc)
- specialist functions (e.g. dental)
- approximate percentage and location (if possible) of high and low clinical risk patients.

### 2.1.3 Incoming water

Provide details of incoming water, both potable and non-potable. If there are various sources, identify the linked uses (see 2.1.1). For example:

- What is the source of the incoming water (e.g. bore, surface, rainwater)?
- What treatment processes does the incoming water undergo before entry into facility?
- Where are the entry points for the incoming to the facility?
- How reliable is the incoming water?
- Is the water treated within your facility?
- Is there an emergency supply and what is its source and quality?

### 2.1.4 Quality of incoming water

Describe the typical water quality characteristics of the incoming water. Parameters to consider are disinfection residual in the water entering the facility, temperature, pH, turbidity, water chemistry, metals and bacteriological quality.

### 2.1.5 System details

Provide overview of water system, for example:

- Incoming water is supplied to a water heater of xxx litres capacity, set at xx degrees C.
- Water within the system is treated using xxx (e.g. copper silver ionisation)

- Heated water is supplied to outlets in two ICU rooms and 5 general wards. Outlets consist of showers, baths, wash basins and sinks.
- Each outlet has a TMV with the maximum distance between heater and TMV of xxx metres.



**Table 2 Inventory of system components (edit, add or delete rows as required)**

System component	Characteristic	Details
Hot water heaters	Number, location, capacity	
	Type of heating	e.g. solar, gas, instant
	Max. temperature	
	Age of heaters	
	Capacity	
Cold water storages	Number, location, capacity	
	Capacity	
	Material	e.g. concrete, steel, plastic
	Water age (i.e. time since disinfection)	If known
Water treatment	Type, location	e.g. chlorine disinfection
	Dose rate (if chemical treatment)	e.g. 1 mg/L
	Target residual at most distal point in water system (if chemical treatment)	e.g. 0.5 mg/L
Pipework	Age	
	Material	
	Type and extent of insulation	
	Number of dead legs and locations	
	Areas of low flow	
	% of pipework that is accessible	
Outlets	Number, type and location of hot water outlets	e.g. 5 sinks in kitchen
	Number, type and location of cold water outlets	e.g. 8 taps in landscaped garden
	Number, type and location of warm water outlets	e.g. 35 showers in maternity unit
TMVs and tempering valves	Type, number, age and location	Include date of last service
	Distance from outlets	
	Accessibility	
	Maximum temperature at outlet	
Other components that use water	Hydrotherapy baths, birthing pools	
	Humidifiers	
	Water dispensing machine	

System component	Characteristic	Details
	Ice machines	
	Cooling towers	
	Rainwater tanks	
	Fire protection system	
RPZ – backflow prevention	Number and location	

## 2.2 Hazard identification and risk assessment

### 2.2.1 Hazard identification

Identify the hazards and potential hazardous events that could affect the water quality within the described water supply system, promoting *Legionella* colonisation and growth, along with their corresponding control measures. The table below lists some examples of potential hazardous events commonly associated with a facility's water system.

**Table 3 Examples of potential hazardous events**

System component	Event
Incoming water	Incoming water contamination
	Loss of supply
	Failure of backflow prevention device
Solar preheat systems	Water stored at below 60°C
Hot water storage	Booster failure
	Heater failure or under capacity
	Build-up of sludge in tank
	Thermal stratification
Cold water storage	Storage temperature too low (below 60 °C)
	Water stagnation
	Contamination of storage tank
	Build-up of sludge in tank
Pipework/plumbing	Water temperature >20 °C
	Dead legs and capped pipes
	Cross connections between potable and non-potable pipes
	Deterioration of insulation (lagging) around pipes
	TMV malfunction or inadequate maintenance
	Long distances between TMVs or tempering valves and outlets

System component	Event
	Corrosion due to deterioration of materials
	Pipe leaks due to age
	Heating of cold water in pipes (>20 °C)
	Low flow in recirculating loops
	Lack of accessibility for repairs and maintenance
Outlets	Poorly maintained outlets
	Unused outlets
	Flow restrictors
	Aerators
	Outlets that hold water after use (e.g. shower heads or hoses)
Treatment systems	Dosing failure
	Insufficient dosing
	Running out of disinfectant

### 2.2.2 Risk assessment

This section includes qualitative measures of likelihood and consequence to allow you to calculate the level of risk for different potential adverse outcomes in your facility. Remember that some controls will be insufficient in themselves to get the level of risk down to low, so keep adding controls until the risk is acceptable.

**Table 4a Qualitative measures of likelihood**

Level	Descriptor	Example description
A	Almost certain	Is expected to occur in most circumstances
B	Likely	Will probably occur in most circumstances
C	Possible	Might occur or should occur at some time
D	Unlikely	Could occur at some time
E	Rare	May occur only in exceptional circumstances

**Table 4b Qualitative measures of consequence or impact on facility**

Level	Descriptor	Example description
1	Insignificant	Insignificant impact, little disruption to normal operation, low increase in normal operating costs (e.g. temporary low chlorine residual that can be resolved via increased flushing)
2	Minor	Minor impact for part of facility, some manageable disruption to normal operation, some increase in operating costs (e.g. several rooms or one wing with total bacterial count >500 CFU/mL, requiring more frequent flushing to maintain chlorine residuals)
3	Moderate	Minor impact for most of facility, significant but manageable modification to normal operation, increase in operating costs, increased monitoring (e.g. extensive bacterial growth with some <i>Legionella</i> , requiring extensive flushing and additional controls)
4	Major	Major impact for part of facility, systems significantly compromised, abnormal (if any) operation, high level of monitoring required (e.g. temporary closure of part of facility requiring extensive disinfection)
5	Catastrophic	Major impact for whole of facility, complete failure of systems (e.g. extensive <i>Legionella</i> colonisation, with possible cases of Legionnaires' disease)

**Table 4c Qualitative risk analysis matrix – level of risk**

Likelihood	Consequences				
	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
A (almost certain)	Moderate	High	Very high	Very high	Very high
B (likely)	Moderate	High	High	Very high	Very high
C (possible)	Low	Moderate	High	Very high	Very high
D (unlikely)	Low	Low	Moderate	High	Very high
E (rare)	Low	Low	Moderate	High	High

**Table 5 Hazard identification and risk assessment table, including examples (edit and add rows as required)**

System component	Hazard and hazardous event	Risk score	Possible control measures
Incoming water	Supply of water with low chlorine residual	Medium	Install onsite chlorination to achieve 0.5 mg/L at all high risk outlets
Incoming water	Supply of microbiologically contaminated water	Medium	Agreement with water supplier to notify facility manager of any bacteriological contamination; increase chlorine dose chlorinator; flush out contaminated water
Hot water system	Water temperature too low (to inhibit growth of <i>Legionella</i> and other opportunistic pathogens)	Medium	Measure temperature daily and adjust if too low
Warm water system	Distance from TMV to outlet > 6 m leading to <i>Legionella</i> detections in high risk location	High	Move TMV closer to outlet or install point of use filter on outlet
Pipework	Low flow in several areas (allows adherence and proliferation of <i>Legionella</i> and other opportunistic pathogens)	High	Weekly flushing of water in areas of low use

## 3 Risk management

Summary of actions:

- Identify and implement control measures for management of risks.
- Establish an operational monitoring program.
- Develop written procedures for required actions.
- Determine and implement corrective actions for exceedance of critical operational limits.
- Establish a verification monitoring program.
- Determine and implement responses to exceedances of limits in the verification monitoring program.

### 3.1 Control procedures

All control measures and monitoring activities, whether they are regular maintenance, operational practices or corrective actions, require written procedures detailing how to undertake the required tasks. Complete the table below with control measures identified in the hazard identification and risk assessment table and operational procedure.

**Table 6 Risk management plan procedures (edit, add or delete rows as required)**

System component	Control measure	Procedure
e.g. pipework	Regular (weekly) flushing of low use areas	e.g. MTS xxxx Flushing of pipes in Ward 2
e.g. treatment	Changing dose rate of disinfectant	e.g. OPS xxxx Adjustment of chlorine dose
e.g. outlet — TMV	Regular maintenance of TMV	e.g. MTS xxxx Cleaning of TMV and thermal disinfection of all pipework and outlets downstream of TMV - yearly
e.g. outlets	Collecting warm water samples for <i>Legionella</i> testing	e.g. SP xxxx Sample collection for <i>Legionella</i> – Warm water <b>AND</b> e.g. SP xxx – sample storage and transportation to City Laboratory

## 3.2 Monitoring

### 3.2.1 Operational monitoring

Many control measures that manage risk in the water supply are in fact corrective actions to measured parameters at particular frequencies and locations when such parameters exceed a critical limit.

Populate the table below with all the operational (i.e. 'real time') monitoring undertaken in the facility.

**Table 7 Operational monitoring, showing examples (edit, add or delete rows as required)**

System component	Risk	Parameter	Frequency	Location	Critical limit	Record (where is the measurement recorded)	Corrective action (all corrective actions listed here should have a procedure listed in Table 6)
Incoming water	Low disinfectant residual	Chlorine residual	Online or weekly	Point of entry into facility	Less than 0.5 mg/L	Chlorine residual record sheet CR 1.001	Increase chlorine dose within facility
Hot Water	Low temperature	Temperature	Weekly	Hot water Outlet in kitchen (sink tap at far right corner)	Temperature less than 65 °C	Weekly temperature kitchen record sheet TP 4.333	Increase temperature of water heater
Warm water	Water temperature that supports <i>Legionella</i> growth	Temperature	Daily	Outlet furthest from water heater (wash basin tap in room xx)	Temperature greater than 20 °C and less than 50 °C	Daily temperature – ward 2 record sheet TP 1.333	Check heater temperature and adjust if required, check pipework for loss of heat, check operation of TMV



3.2.2 Verification monitoring and responses

Verification monitoring involves the taking of samples for analysis of a particular parameter. The results of the samples confirm that control measures are effective and water quality risk is being managed.

All verification monitoring results that are outside quality standards or critical limits, and confirmed cases of Legionellosis, require responses.

Populate the table below with all the verification monitoring undertaken in the facility.

**Table 8 Verification monitoring, showing examples (edit, add or delete rows as required)**

Parameter	Frequency	Location	Limit	Reported to	Operational response to exceedance of critical limit <i>(all responses should have a procedure as per Table 6)</i>	Clinical response to exceedance of limit <i>(all responses should have a procedure listed as per Table 6)</i>
Heterotrophic plate count	Monthly	Distal warm water taps — wash basins in rooms xxx	Greater than 500 CFU/mL	Building, engineering and maintenance services (BEMS) supervisor	<ol style="list-style-type: none"> <li>1. Check operational measurements (temperature, pH, turbidity, disinfectant residuals and dose), maintenance schedules (including flushing regimes) and structural integrity</li> <li>2. Flush water through until sufficient disinfectant residual is achieved at sampling point</li> <li>3. Resample after responses are completed</li> </ol>	None
<i>Legionella</i> spp.	Quarterly	Distal warm water taps — wash basins in room with low risk patients	Greater than 10 CFU/100 mL	BEMS manager and CEO	<ol style="list-style-type: none"> <li>1. Check operational measurements, maintenance schedules and structural integrity of system</li> <li>2. Clean and sanitise TMV and outlet fitting</li> <li>3. If resample positive, move to next row</li> </ol>	Remove patient/s from affected room
<i>Legionella</i> spp.	Quarterly	Distal warm water taps — wash basins in room with high risk patients	Greater than 10 CFU/mL	BEMS manager and CEO	<ol style="list-style-type: none"> <li>1. Check operational measurements, maintenance schedules and structural integrity of system</li> <li>2. Clean and sanitise TMV and outlet fitting</li> <li>3. Clean pipework</li> <li>4. Superchlorinate system</li> </ol>	Remove patient/s from affected room

## 4 Responding to detections or cases

Summary of actions:

- Identify measures for responding to *Legionella* detections and cases in various scenarios.
- Identify key people and their responsibilities and authorities when responding to detections or cases.
- Develop written procedures for required actions.

### 4.1 Key incident response people and their responsibilities

In an incident situation, the risk management team will meet to assess the available information and direct the appropriate responses. The following people will be required to direct those responses and ensure they are undertaken in accordance with documented procedures.

**Table 9 Incident response key personnel and their responsibilities**  
(edit, add or delete rows as required)

Response	Responsible person	Contact information
e.g. water sampling / system investigation		
e.g. coordinating system decontamination		
e.g. high risk patient identification		
e.g. implementation of high risk patient protection procedures		
e.g. media liaison		

### 4.2 Response procedures

Response activities, whether they are investigations, remedial action or stakeholder liaisons, require written procedures detailing how to undertake the required tasks. Complete the table below that matches responses identified in the incident response measure identification process.

Some of these responses will be sequential and will require information obtained following the implementation of other proceeding procedures. It may also be useful to prepare flow charts showing the sequence of actions required in various incident scenarios.

**Table 10 Incident response procedures (edit, add or delete rows as required)**

Incident	Responses	Procedure name
e.g. isolated <i>Legionella</i> species detection	Water sampling or system evaluation	e.g. INV xxxx Undertaking a <i>Legionella</i> colonisation investigation
e.g. isolated <i>Legionella</i> species detection	Localised partial system decontamination	e.g. INC xxxx Assess and undertake appropriate local partial system decontamination
e.g. single confirmed Legionnaires' disease case linked to facility	Case activity investigation	e.g. INC xxxx Assess potential case exposures during incubation period
e.g. single confirmed Legionnaires' disease case linked to facility	High risk patient identification	e.g. INV xxxx Undertaking a high risk patient identification
e.g. single confirmed Legionnaires' disease case linked to facility	Implementation of high risk patient protection procedures	e.g. INC xxxx Protecting identified high risk patients

## 4 Review of plan

Summary of actions:

- Prepare a schedule for review of the plan.
- List reasons for updating of plan.

A full review of the plan will be conducted on a XXXX basis.

The plan will be reviewed more frequently as a result of:

- List reasons: (e.g. change in infrastructure, detection of *Legionella*, new staff or roles, changes in legislation or standards etc)

# Appendix

## Key contacts

List key contacts for the plan including risk management team members, laboratory testing, equipment suppliers or service agents, local public health units etc.

## Key documents

List key documents for reference, such as national guidelines, state/territory legislation, procedures etc.