



Government of **Western Australia**
Department of **Health**

Air-handling and water systems of commercial buildings review

Managing the public health risks associated with cooling towers and warm water systems in WA

In accordance with the *Public Health Act 2016* regulatory framework

March 2019



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Have your say

The Department of Health (DOH) is seeking feedback on this Discussion Paper on the proposed regulatory reforms and options for the management of public health risks associated with air-handling and water distribution systems in Western Australia.

You are invited to read through this discussion paper and provide your feedback by completing the online survey.

Stakeholder input is critical in helping to identify the most appropriate management response or identify new options not considered as part of this proposal, and to ensure the impacts on consumers, business and government have been effectively considered.

Where to send your feedback

Online:	WA Health online consultation hub - https://consultation.health.wa.gov.au/
Email:	publichealthact@health.wa.gov.au
Post:	Review of Air-handling and water systems Science and Policy Unit Environmental Health Directorate Department of Health PO Box 8172 Perth Business Centre, WA 6849

Submissions close

The closing date for submissions is **31 July 2019**

Disclaimer

The views expressed in this document may not, in any circumstances, be interpreted as stating an official position of the Department of Health. This document is intended to serve as the basis for further discussion with interested stakeholders.

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Overview of air-handling and water systems in Western Australia

Public health risks

Potential growth of *Legionella pneumophila* in poorly maintained and operated cooling towers and warm water systems.

This can lead to outbreaks of Legionnaires' Disease and other respiratory illnesses.

Since 2005, on average there are 11 cases of Legionnaires Disease related to *Legionella pneumophila* reported in WA each year.



Who may be impacted by changes to the *Health (Air-handling and Water Systems) Regulations 1994*?

~3192

WA businesses are estimated to have a cooling tower

~396

WA based health and aged care facilities are estimated to have a warm water system

40
out of
139

WA local governments are estimated to have an enforcement role based on cooling towers or warm water systems located within their jurisdiction



Executive summary

The key focus of this review is to obtain feedback on the most effective option for managing the potential public health risks associated with air-handling and water distribution systems in Western Australia (WA), to prevent the spread of air-borne diseases such as Legionnaires' Disease caused by *Legionella pneumophila*.

With the introduction of the *Public Health Act 2016* in WA, the [Health \(Air-handling and Water Systems\) Regulations 1994](#) (Air-handling Regulations) which are adopted under the *Health (Miscellaneous Provisions) Act 1911*, must be reviewed and either repealed or replaced with new regulations in accordance with the new regulatory framework.

This paper discusses the current management of cooling towers and water systems under the Air-handling Regulations, which adopt a number of Australian and New Zealand Standards from set 3666 Parts 1, 2 and 3. This paper also analyses the various options for managing the public health risks of cooling towers and water distribution systems in WA into the future, including the potential advantages, disadvantages and costs of each option to industry, consumers and government. Four options considered as part of this review include:

- **Option A: Enable the industry to self-regulate by providing an industry guideline or Code of Practice.**
 Enable the industry to self-regulate by providing an industry guideline or Code of Practice outlining acceptable practices. A person will not be taken to have breached the general public health duty if they have acted in a manner that is consistent with a guideline or other acceptable practices. A person will not be taken to have breached the general public health duty if they have acted in a manner that is consistent with the guideline or other generally accepted practices. Where a person is in breach of the general public health duty, further action such as the issuing of an improvement notice or enforcement order may be considered under the Public Health Act.
- **Option B: Retain the status quo by making equivalent regulations under the Public Health Act**
 That is, replace the current regulations with equivalent regulations as far as practicable.
- **Option C: Develop new regulations to manage this public health risks, with building requirements addressed by the Building Code of Australia**
 The new regulations would manage this public health risk and ensure building requirements are addressed by the Building Code of Australia. Regulations would specify roles of local government enforcement agencies.
- **Option D: Manage this public health risk under Occupational Safety and Health legislation**
 Manage this risk under the existing [Code of Practice - Prevention and control of Legionnaires' Disease 2010](#) issued by the Commission for Occupational Safety and Health (the Commission) and under the provisions of the [Occupational Safety and Health Act 1984](#) (WA) (the OSH Act) and the *Mines Safety and Inspection Act 1994* (WA) (the MSI Act).

The Department of Health's preferred option is option C, the development of new regulations to manage this public health risk under the *Public Health Act 2016*. However, stakeholder input is critical in helping to identify the most appropriate management response or identify new options not considered as part of this proposal, and to ensure the impacts on consumers, business and government have been effectively considered.

1 Aim

This paper will focus on determining the most effective option for managing the public health risks associated with commercial air-handling systems and water distribution systems in WA, with a particular emphasis on preventing Legionnaires' Disease and other airborne diseases associated with these man-made systems.

2 Objectives

The overall objectives for managing the public health risks associated with air-handling and warm water systems are to:

1. Ensure the correct operation and regular maintenance of air-handling systems installed in WA buildings
2. Ensure the correct operation and regular maintenance of water distribution systems in high risk buildings such as hospital's and aged care facilities
3. Ensure timely and effective control measures are initiated in the event of a Legionnaires' Disease outbreak in WA to minimise the risks to public health
4. Prevent outbreaks of Legionnaires' Disease and other airborne diseases from cooling towers and water distribution systems in WA.

Note: *Public health* is defined in the *Public Health Act 2016* to mean the health of individuals in the context of the wider health and wellbeing of the community.

This review does not consider Legionella risks associated with spas, which have been considered as part of the recent review of Aquatic Facilities in WA.

3 Introduction – Regulation review program

In the lead up to the stage 5 of implementation of the *Public Health Act 2016* (the Public Health Act) the Environmental Health Directorate of the Department of Health (DOH) of WA is required to review all environmental health related regulations adopted under the *Health (Miscellaneous Provisions) Act 1911*. The review will determine whether certain public health risks must continue to be regulated under the new framework provided by the Public Health Act, or whether these risks can be effectively managed through an alternative approach such as a local law, other legislation or a guideline.

The purpose of the Public Health Act is to protect, promote and improve the health and wellbeing of the public of WA and reduce the incidence of preventable illness. Section 304 of the Public Health Act provides broad powers for making regulations and allows regulations to authorise, prescribe, require, prohibit, restrict or otherwise regulate a number of matters.

[Appendix 1](#) provides an overview of the regulatory mechanisms provided for under the Public Health Act.

It is proposed that the existing environmental health regulations will be consolidated, where appropriate, into a streamlined and more manageable number of regulations that are grouped by public health risks / themes including:

1. Events and mass gatherings
2. Body art and personal appearance services
3. Built environment (including legionella control)
4. Pests and vector control
5. Water
6. Public health assessments.

As part of the review, the [Health \(Air-handling and Water Systems\) Regulations 1994](#) (Air-handling Regulations) which are adopted under the *Health (Miscellaneous Provisions) Act 1911*, must be reviewed and either repealed or replaced with new regulations in accordance with the new Public Health Act framework.

This paper reviews the available evidence on air-handling and water distribution systems, and outlines a number of options for managing the public health risks associated with these systems in WA.

If regulations are considered to be the most effective control measure, they would be created under the new Public Health Act with the specific regulatory requirements being integrated within the proposed regulations relating to either the built environment or water.

A key consideration in the development of any proposed regulation by the DOH is alignment with the State Government's [red tape reduction program](#) which aims to minimise unnecessary regulatory burden on industry. This is achieved by complying with the Department of Treasury Regulatory Impact Assessment (RIA) process, which is administered by the Better Regulation Unit.

The options presented in this paper comply with the RIA process by:

1. providing an overview of the risks associated with air-handling and warm water systems
2. reviewing current legislative and other best practice management requirements enforced in Australia and internationally
3. reviewing what management processes work, and the limitations or lessons to be learnt from other legislation
4. determining the cost impacts of not having management controls in place versus having regulatory controls
5. outlining the advantages and disadvantages of a number of options to consumers, business and local and State governments.

4 Statement of the issue - the public health risk

Legionnaires' Disease is a serious and sometimes fatal form of pneumonia caused by the bacteria *Legionella pneumophila* (Figure 1). People usually contract Legionnaires' Disease by breathing in *Legionella* bacteria in very fine droplets of water called aerosols.

In WA, there are on average around 11 diagnosed cases of infection by *Legionella pneumophila* reported each year [1]. *Legionella* infections are believed to account for 5 - 15 per cent of community acquired pneumonias, although there is significant evidence to suggest that the disease has historically been substantially under-diagnosed, thus making estimation of its incidence inherently difficult [2].

Legionella bacteria are common in natural water sources such as rivers, lakes and reservoirs but are usually low in numbers and therefore conditions are rarely suitable to be a concern to public health.

As *Legionella* bacteria thrive in warm water and warm damp places, artificial water systems can provide environments that enable *Legionella* bacteria to increase in large numbers. These artificial systems include:

- cooling towers (Figure 2) and evaporative condensers
- evaporative air conditioners



Figure 1 *Legionella pneumophila* bacteria

- warm water systems (e.g. showers) (Figure 3)
- misting or droplet spray systems
- spa pools and hydrotherapy pools
- fountains (Figure 4) [1].

Figure 5 outlines common sources of *Legionella pneumophila* that have been implicated in Legionnaires' Disease outbreaks worldwide [3].



Figure 2 Cooling tower

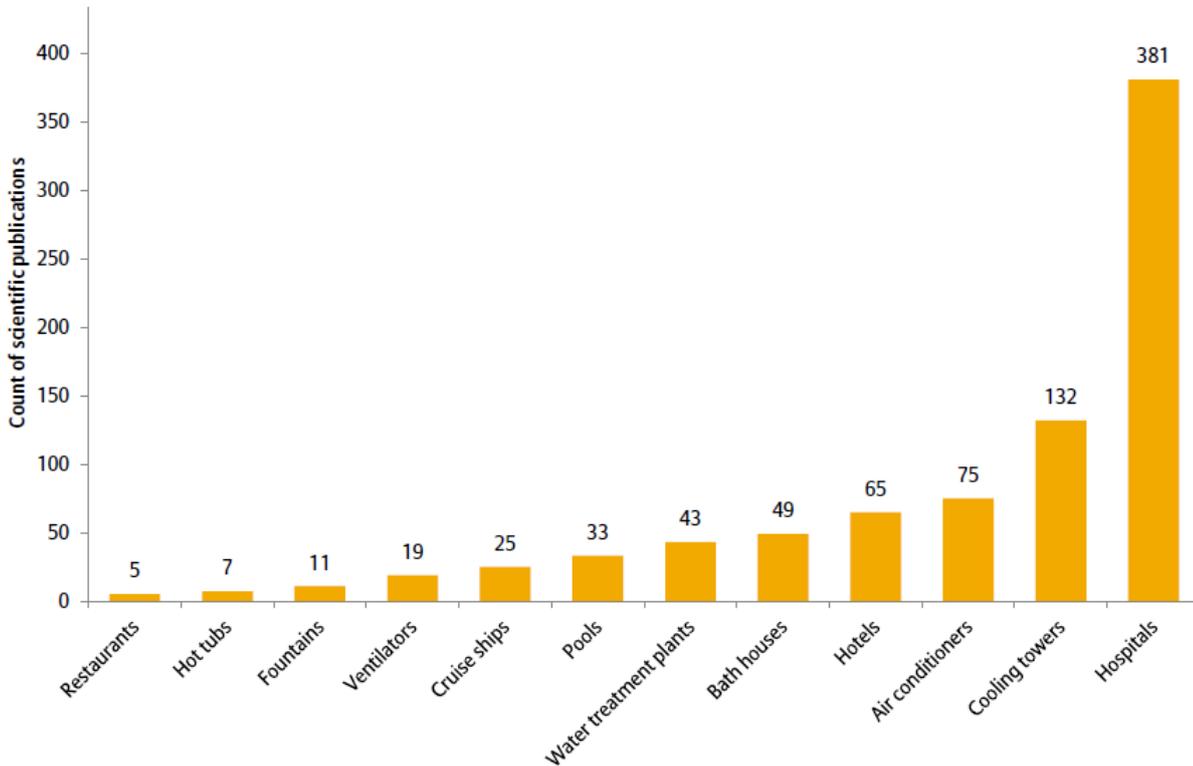


Figure 3 Warm water system



Figure 4 Water fountain

The first recorded outbreak of Legionnaires' Disease occurred in November 1976, with 25 people dying between the ages of 39 to 82.



Source: Praedicat

Figure 5 The number of scientific publications listed by the National Library of Medicine that mention worldwide areas of potential Legionella exposure or devices that spread the disease. Source: [Emerging Liability Risks \[3\]](#)

As Figure 5 indicates, the most common sources of infection include:

- **Hospital and aged care facility warm water systems** - Warm water systems distribute water to outlets used for personal hygiene purposes such as showers, basins and baths, at a reduced temperature (in the vicinity of 40 degrees), to minimise the risk of scalding. They should not be confused with the 'heated water system' typically installed in all, or most, buildings, including circulatory heated water systems that are designed to distribute

heated water at higher temperatures, although there are numerous similarities. Many hospitals have warm water systems to minimise scalding to patients [4].

- **Cooling towers** - A cooling tower is a device for lowering the temperature of water by evaporative cooling in which atmospheric air is in contact with falling water, thereby exchanging heat. Many buildings such as hotels, hospitals, shopping centres, office towers and universities may have one or multiple cooling towers installed on each building.

In addition to Legionnaires' Disease, Pontiac Fever is a milder infection that can also be caused by poorly maintained cooling towers and warm water systems. Symptoms begin between a few hours to 3 days after being exposed to the bacteria and usually last less than a week. Pontiac Fever is different from Legionnaires' Disease because someone with Pontiac Fever will not get pneumonia. Pontiac Fever is also caused by *Legionella* bacteria. By addressing the risks of Legionnaires' Disease, the risks of Pontiac Fever would also be managed.

4.1 Risk factors

Conditions that increase the likelihood of the growth of large numbers of *Legionella* bacteria include:

- water temperature of between 20 - 45°C in all or some parts of a system
- production and dispersal of water droplets
- storage or re-circulation of water, commonly found in large water supply systems
- presence of deposits in the water system, such as rust, algae, sludge, scale or biofilms, as these can support bacterial growth (Figure 6) [5].

The *Legionella* organism obtains nutrients from micro-organisms such as algae, protozoa and other bacteria and by the utilisation of some organic and inorganic material. *Legionella* species multiply at temperatures ranging from 20°C to 45°C, with maximum growth occurring between 32°C and 43°C. They survive freezing but are killed with increasing rapidity as temperatures exceed 45°C. Survival time decreases from hours at 50°C to minutes at 60°C while at 70°C the organism is killed almost immediately [5].

Inhalation of aerosols generated by these systems can serve as a route of infection.

Outbreaks of illness usually occur from *Legionella* growing in purpose built systems where water is maintained at a temperature high enough to encourage growth.

4.2 Why do outbreaks occur?

Cases of Legionnaires' Disease associated with a cooling tower system (Figure 7) usually occur when a number of conditions are met. First, *Legionella* enters the cooling tower system, presumably from the water supply. The bacteria then multiply as a result of one or more of the following scenarios:

- failure to treat the water to an adequate standard, which can be due to:
 - a lack or breakdown of a regular treatment schedule or system equipment
 - changes in water chemistry influencing the effectiveness of the treatment chemicals
 - human error



Figure 6 Algae growing in cooling tower water. Photo courtesy of [LinkedIn](#).

- environmental contamination of the cooling tower water – for example, by airborne dust from nearby construction works
- poor design or location of the cooling tower system
- inadequate or non-existent maintenance (including plans for replacement of ageing cooling tower systems).

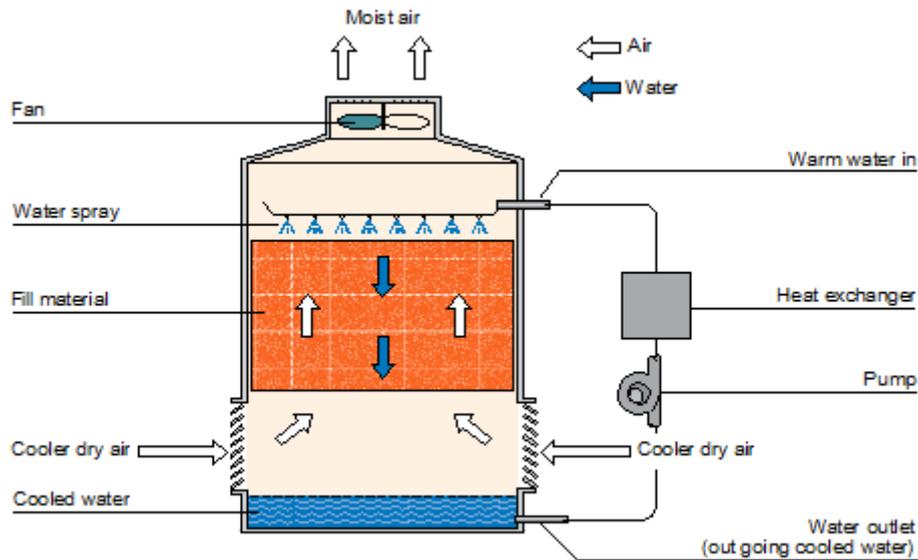


Figure 7 A typical side profile of a cooling tower Source: VicHealth

4.3 Symptoms

It usually takes 2 to 10 days after exposure for Legionnaires' Disease to develop. In most cases symptoms appear after 5 to 6 days.

The early symptoms of Legionnaires' Disease are typically similar to severe 'flu-like' illness, and may include:

- fever
- chills
- muscle soreness
- headaches
- tiredness
- reduced appetite
- dry cough and shortness of breath.

Sometimes other parts of the body are affected, which can lead to diarrhoea, vomiting, mental confusion and kidney failure. Many people with Legionnaires' Disease are admitted to hospital for long periods and spend some of this time in intensive care. For a minority of sufferers, the disease is fatal. A small percentage may suffer some permanent disablement [6] [1].

4.4 Susceptibility

Most people exposed to Legionella bacteria do not become infected. Legionnaires' Disease tends to occur in people who:

- are over 50 years old
- are male
- have a history of smoking

- have heavy alcohol intake
- have long term medical conditions that weaken the body's immune system (such as cancer, lung disease, diabetes, and transplant patients) or
- are on immunosuppressant drugs.

Infection cannot be transmitted from person to person [5].

4.5 Notifiable diseases

Any medical practitioner or nurse practitioner attending a patient whom he/she knows or suspects has a notifiable infectious disease or a related condition, which includes *L.pneumophila*, has a legal obligation to report the diagnosis to the WA Department of Health.

If analysis of a sample undertaken at a pathology laboratory indicates that the patient from whom the sample was taken has or had a notifiable infectious disease, the responsible pathologist of that pathology laboratory also has a legal obligation to report the diagnosis to the Department of Health. Notifiable infectious diseases and related conditions are notifiable under the *Public Health Regulations 2017*.

Over the past decade, there have been 129 reported cases of *Legionella pneumophila* notified to the WA Department of Health (detailed in Figure 9). On average, this is around 11 diagnosed cases of infection by *Legionella pneumophila* each year. However, there has been a notable increase in the number of cases reported each year between 2005 and 2016 (Figure 7).

Of the cases listed in Figure 8, only 7 cases were considered to be an outbreak, defined as two or more cases. Five cases were associated with an outbreak on a vessel, and 2 cases had visited the same area in Fremantle at the same time, though no source was ever confirmed.

Figure 8 projects that the number of Legionnaires' Disease cases reported each year will increase exponentially. This projected increase may be attributed to WA's ageing population, more people being diagnosed with chronic illnesses and the age of WA's plumbing and building infrastructure.

Almost all patients diagnosed with a *Legionella* infection will need to be admitted to hospital for treatment. Legionnaires' Disease can result in death if not treated in time. Most people who are diagnosed with Legionnaires' Disease will need to be treated with antibiotics.

Between 2005 to 2016, there has been on average 11 cases of Legionnaires' Disease reported in WA each year. However, the number of cases reported each year is increasing.

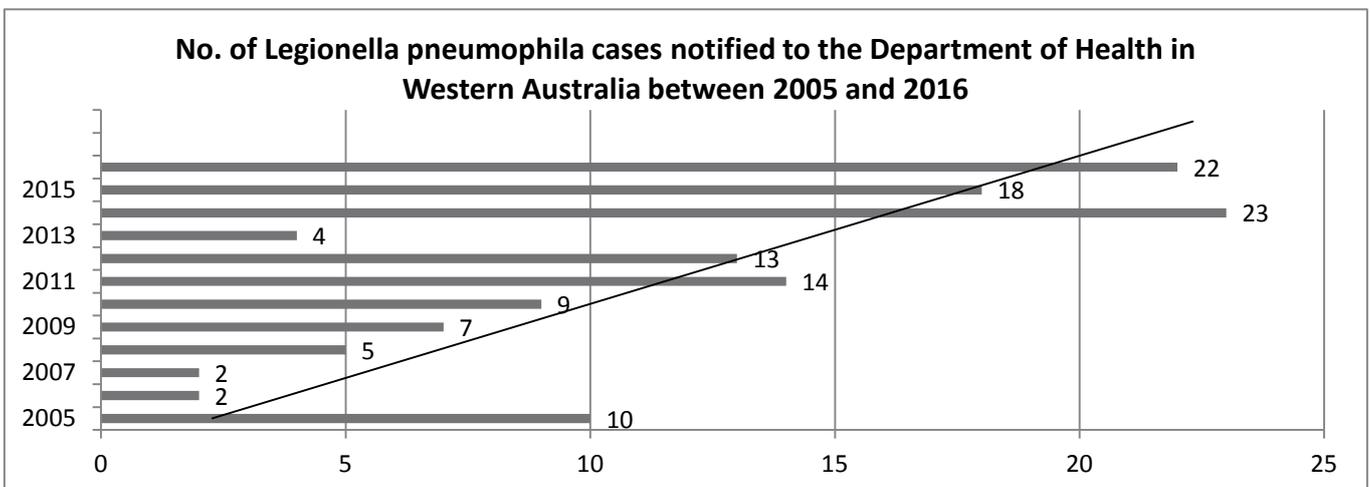


Figure 8 Number of cases of *Legionella pneumophila* notified to the Department of Health in Western Australia between 2005 to 2016

Most patients who receive early antibiotic treatment begin to improve within 3 to 5 days but usually require treatment for 10 to 14 days [7].

WA in comparison to other Australian States and Territories tends to receive a significantly lower number of reported cases of *Legionella pneumophila*, with a comparison of cases recorded across Australia for 2010 detailed in Table 1. It is not known why this is the case.

Table 1 Cases of legionella pneumophila for 2010 by Australian States and Territories

Species	State or Territory								Australia
	ACT	NSW	NT	Qld	SA	Tas	Vic	WA	
<i>Legionella pneumophila</i>	0	39	1	18	9	5	53	8	133 [†]

Source: [Australia's notifiable diseases status, 2010: Annual report of the National Notifiable Diseases Surveillance System](#)

Interestingly, six of the 8 *L. pneumophila* cases reported in WA in 2010 acquired their infections in Bali, Indonesia and five of these cases stayed at a particular hotel in Kuta, Bali. An additional 4 cases associated with this hotel or a nearby exposure source were identified in Victoria from travellers recently returned from Bali.

Although WA has not had any significant outbreaks, this does not mean WA is not susceptible, particularly as the population grows and infrastructure ages.

4.6 Outbreaks

An outbreak of Legionnaires' Disease is defined as two or more cases linked in time and place to a common source. There have been no significant outbreaks recorded for WA. So far, most cases of Legionnaires' Disease have been sporadic, single cases with no links found to other cases.

Although WA has not had any significant outbreaks, it does not mean WA is not susceptible to an outbreak, particularly as the population and infrastructure ages.

Table 2 highlights Legionnaires' Disease outbreaks that have occurred in Australia between 1991 to 2000, the different types of venues implicated in the outbreaks, the source of infection and the number of cases, deaths and fatality rates.

Table 2 Notable outbreaks of legionellosis, Australia, 1991 to 2000 [8]

No.	Year	Season	Place	Area	Likely source	No. of cases
1	1992	Autumn	Fairfield, Sydney	Shopping centre	*	26
2	1993	Autumn	Parramatta, Sydney	Hotel	*	4
3	1994	Autumn	Western Sydney	Hotel car park	*	4
4	1994	Winter	Western Sydney	A club	*	7

5	1994	Winter	Sunshine coast, Queensland	Holiday apartment unit	Private spa pool	3
6	1995	Summer	Sydney	Shopping centre	*	11
7	1996	Autumn	Melbourne	Metropolitan area	Not identified	7
8	1996	Autumn	Kangaroo Island, South Australia	Tourist resort	Spa pool	4
9	1998	Winter	Moonee Valley, Victoria	Suburban shopping district	*	4
10	1998	Spring	Thomastown, Victoria	Industrial area	*	18
11	1998	Summer	Western Sydney	Work place	*	3
12	1998	Not reported	Victoria	Supported accommodation hostel	Not identified	2
13	1998	Not reported	Victoria	Hospital	*	3
14	1999	Summer	Melbourne	Community	*	3
15	1999	Summer	Wentworth & Western Sydney	Source unclear	Not identified	7
16	1999	Winter	Melbourne	Social club	Spa pool	2
17	2000	Summer	Carlton-Fitzroy, Victoria	Community	*	6
18	2000	Autumn	Melbourne	Metropolitan area	*	5
19	2000	Autumn	Melbourne	Aquarium	*	125
20	2000	Autumn	Cobram, Victoria	Community	*	6
21	2000	Winter	Collingwood, Victoria	Football club	Spa pool & shower	4
22	2000	Summer	Melbourne	Private hospital	*	5

4.7 Impacts on businesses

Outbreaks of Legionnaires' Disease associated with man-made system can have devastating impacts on a business. During an outbreak, it is probable that the normal operation of a business will be severely disrupted. In some cases, the business may have to suspend all operations until the source of the outbreak is located and treated. Legal action for damages suffered by individuals or companies as a result of an outbreak of Legionnaires' Disease is also likely. This can be a costly exercise for a business (including a public or private hospital) that has not followed a consistent risk management program to control the risks.

Negative media attention is likely, and the business may suffer significant loss of trade and customer goodwill for a long time after the outbreak has been contained. Examples of media responses to Legionnaires' Disease outbreaks in Australia are detailed in Figure 10.

An example of an Australian public liability case arose following the 2000 Legionnaires Disease outbreak at the Melbourne Aquarium. On 4th May 2000, Maurice Blackburn issued a class action in the Supreme Court of Victoria which made allegations of negligence against the Melbourne Aquarium, the construction company, mechanical engineers, an air conditioning company and the water treatment company in relation to the maintenance, cleaning, testing, and/or repair of the cooling towers and/or the pumps serving the cooling towers at the Melbourne Aquarium [9]. The case was settled out of Court so the exact liability payout for this outbreak is not publicly known.

Reported settlements and jury awards for Legionnaires' Disease outbreaks caused by a business have ranged from \$225,000 to \$5.2 million [10]. These large awards are meant to compensate survivors of deceased victims, as well as reimburse sufferers of the disease for their pain and suffering. Legionnaires' Disease lawsuit settlements also include amounts for medical expenses, lost wages, disability and any other lawful damages. The awarding of punitive damages due to gross negligence may also add to the exposure of liable parties [10].

Therefore the cost of controls that are required by industry to minimise the risks of Legionnaires' Disease are insignificant compared to the potential public liability costs that may follow in the event of an outbreak, particularly if a fatality occurs.

4.8 Impacts on government

The role of governments is to ensure commercial operators of cooling towers, warm water systems and other sources of *Legionella* infection are complying with generally accepted standards to prevent an outbreak of Legionnaires' Disease impacting the community.

Health authorities need to be in a position to respond to an outbreak of Legionnaires' in a timely and efficient manner to mitigate the number of deaths and illness from an incident. Without appropriate controls in place to be able to respond to an outbreak, significant delays may be experienced by government authorities in being able to detect the source of infection. This is likely to result in increased exposure and incidence of disease and the need for additional government resources for epidemiological, microbiological and environmental health investigations, as well as the costs of treating the patients in hospital.

An example of this followed an outbreak in New York City (NYC) in the South Bronx in 2015, which resulted in 138 confirmed cases with 16 deaths. No regulations were in place to manage the public health risks of Legionnaires'. The Governor of NYC, Governor Cuomo described the outbreak as "*a bad science-fiction movie.*" Michael Benjamin, a former assembly member and political columnist, wrote that "*in nearly 40 years since the original deadly Legionnaires' outbreak ... it's mind-boggling that no rules or regulations were put into place to prevent deadly new eruptions of the disease.*" This outbreak created considerable fear and anxiety amongst the

Without appropriate controls in place to be able to respond to a Legionnaires' Disease outbreak, significant delays may be experienced by health authorities in being able to detect the source of infection.

This may result in more people being exposed to Legionnaires' and significant funds may be required for epidemiological, microbiological and environmental health investigations, as well as the costs of treating patients in hospital.

community who did not think NYC was capable of appropriately responding to the outbreak. A significant environmental health investigation followed, with 55 cooling towers tested [11].

Following the outbreak, the New York Department of Health and Mental Hygiene (DOHMH) seized on this moment of strong political capital to gain support for a citywide registry of cooling towers. Environmental health and communicable disease officials within the DOHMH had recognised that this initiative was necessary to expedite Legionnaires' investigations. The concept of having immediate and up-to-date knowledge on all cooling tower locations in the city was particularly appealing and the creation of the registry became a priority[12].

A paper in the United Kingdom attempted to quantify the public health costs associated with investigating an outbreak of Legionnaires' Disease in South East London. These costs reviewed the epidemiological, microbiological and environmental health investigations. The overall cost was estimated to be £455,856 pounds (~\$800,161 Australian dollars), with 14 % spent on the investigation and control of the outbreak compared to 86% (or ~\$658,141 Australian dollars) spent on the hospital treatment of the patients[13].

The study concluded that the time and money spent on public health services in this investigation appeared to represent good value for money considering the potential costs of a major outbreak, including the high case-fatality rate in Legionnaires' Disease outbreaks and the high health care costs.

4.9 Community focus

Illness and deaths caused by Legionnaires' Disease can cause significant community concerns and are a highly emotive issue that result in extensive media attention. This is particularly the case when an outbreak has occurred in a hospital or aged care facility with highly susceptible immunocompromised people residing in these buildings.

Although WA has yet to record a significant outbreak of Legionnaires' Disease, there are numerous examples of outbreaks that have occurred Australia wide (and internationally) that have attracted significant media and community attention, and resulted in a number of deaths.

A small selection of online media articles (Figure 9) highlights the highly emotive reaction that an outbreak can create within a community.

Although WA has yet to record a significant outbreak of Legionnaires' Disease, there are numerous examples of outbreaks that have occurred Australia wide (and internationally) that have attracted significant media and community attention, and resulted in a number of deaths.

ABC NEWS

Legionnaires outbreak linked to car wash

Posted Wed 21 May 2008, 3:23pm

Victoria's chief health officer will consult the car wash industry about an outbreak of Legionnaires disease, linked to a car wash in Hoppers Crossing, near Werribee, west of Melbourne. MAP: Werribee 3030

Six men and a woman who used the car wash in Old Geelong Road, are recovering after contracting Legionnaires over the past month.

Dr John Carnie says five samples from the business tested positive to the Legionella bacterium.

Dr Carnie says he is holding talks with the car wash industry to address the use of warm water, where bacteria can thrive.

"This is something that obviously we're taking very seriously," he said.

"We're meeting, as I said, as a matter of some urgency with the industry and we want to make sure we will be in a position to put out some advice to the industry as soon as possible."

Outbreak of legionnaires' disease may have started in hospital in Sydney's south

By Michelle Brown

Posted Fri 1 Apr 2016, 2:34pm

Three cases of legionnaires' disease have been revealed in Sydney's south with a cooling tower at St George Hospital identified as a possible source.

Authorities said the tower has been cleaned of the bacteria and other cooling towers in the Kogarah district were now being checked.

Last month, a man aged in his 80s died after contracting legionnaires' disease after an outbreak in Sydney's CBD.

RELATED STORY: Four people with legionnaires' disease hospitalised in Sydney

RELATED STORY: Man in 80s dies after legionnaires' disease outbreak

RELATED STORY: Health officials on alert for more cases of legionnaires' disease in Sydney

MAP: Kogarah 2217

Water bug outbreak kills again

CLARISSA BYE

A PERSON has died following yet another outbreak of deadly legionnaires disease — this time at Burwood.

It is the second death in two months from the bug.

A NSW Health spokeswoman said three people were infected in the latest outbreak, with the third person only identified yesterday. One has died.

Health authorities and Burwood Council are investigating 13 air-conditioning cooling towers within a 250m radius of Burwood Plaza.

The three Burwood cases are not related to the recent outbreak in the Sydney CBD. Since the start of 2016, there have been two clusters of the disease in the city's CBD, including eight cases confirmed in March and a further five cases confirmed last week.

In NSW, there have been 38 cases of the legionnaires disease strain associated with airconditioning and water sources (legionella pneumophila) this

year. Only last week two more men, in their 40s and 50s, were discovered to have been infected with the legionella bacteria from airconditioning cooling towers in the city.

At Burwood, the first case was identified on May 6 and the second on May 13. So far five cooling towers in the city have tested positive to the legionella bacteria, out of 89 tests.

Health officials were not able to pinpoint the source of the original CBD outbreak. In March, a man in his 80s died after contracting the disease near Town Hall.

Health authorities have previously said a rise in legionnaires could be due to the warmer weather, and the prolonged use of airconditioning. Legionnaires is usually spread by breathing bacteria-contaminated water vapour or dust and can be connected with contaminated air conditioning systems in large buildings. It can take between 2 to 10 days for the disease to develop. Patients usually need treatment in hospital.

SA Health urges air conditioning clean-out after spike of legionnaires' disease in Adelaide

By Alina Eacott

Updated Fri 20 Jan 2017, 9:07am

Hundreds of air conditioning units across buildings in Adelaide's CBD and inner-city suburbs are being checked, after a spate of legionnaires' disease cases in the past week.

MAP: Adelaide 5000

SA Health's acting chief public health officer Dr Ken Buckett said four men have contracted the disease.

"All four people have been hospitalised and they're receiving the treatment they need," Dr Buckett said.

"It's a very nasty condition ... the symptoms are like pneumonia.

"There's a lot of scrutiny focused on this, so we can't find out how we can best manage it."

Palliative care patient tests

DEADLY DISEASE IN ICE

ABC NEWS

Deadly legionella bacteria found in Perth Children's Hospital drinking water

EXCLUSIVE by Jessica Strutt

Updated Sat 4 Nov 2017, 6:53am



Figure 9 Examples of media articles on Legionnaires' Disease outbreaks in Australia

4.10 Emerging risks

Car washes

Car washes, a growing industry in Australia, have been linked to Legionnaires' Disease. In 2008, seven people contracted the disease in Victoria from a car wash. This outbreak instigated the Victorian State Department of Health to amend the *Public Health and Wellbeing Regulations 2009* to capture commercial car washes, which must now develop a risk management plan for such systems.



Figure 10 Car washes have been implicated in Legionnaires' Disease outbreaks

Regulators had not previously been aware that car wash facilities employed warm water systems. The 2008 outbreak led to the realisation that the majority of car washes employ warm water systems and provided clear evidence that these facilities can in certain circumstances pose a risk to individuals not previously identified as vulnerable. Statistical data on the risk posed by car washes is not available. However, the fact that Legionnaires' Disease is spread through contact with aerosols combined with the observation that car washes generate substantial exposure to such aerosols, suggests that warm water systems operating in this context are likely to be associated with a significantly higher risk profile [2].

Water spray misters

Automatic misting devices such as misters to cool fruit and vegetable displays and cooling misters that spray a fine mist can allow water droplets to be inhaled into the lungs which may potentially contain *Legionella* if the conditions are right. Water spray misters are also increasingly common during the hotter months to cool patrons in outdoor seating areas at restaurants and at day time festivals. The use of such systems is also increasingly popular in the north-west of WA where temperatures soar above 40 degrees. However, water spray misters have not been regulated in any Australian State or Territory, and no cases of Legionnaires' Disease have been linked to misting systems.



Figure 11 Examples of common spray misters used to cool temperatures

Spas / hot tubs

Spa systems are increasingly popular and can be found in a variety of sizes and settings. Such systems pose a risk as they are a recognised source of diseases caused by infectious agents including *Legionella pneumophila*. There have been a number of outbreaks linked to spa systems in leisure centres, hotels, holiday homes, on cruise ships and on display. A person can

get infected with legionella when they breathe in steam or mist from a contaminated hot tub [14].

In WA, the legionella public health risks in spa pools are managed under the *Health (Aquatic Facilities) Regulations 2007*. The intention is to continue to manage the Legionnaires' Disease risks of spas in future aquatic facilities legislation created under the Public Health Act regulatory framework.

Ice machines

Manufactured water systems such as ice machines and chilled water dispensers can also produce conditions that enable Legionella to survive and grow, but due to their lack of aerosol production these devices are only considered to be a high risk to the severely immunocompromised through pulmonary aspiration. Where extraordinary procedures such as air filtration and restricted food diets are used to protect high risk patients from infection, these procedures should extend to drinking water and ice machines. Ice machines should be inspected monthly and cleaned as necessary as per the manufacturer's instructions, and in any event at least once annually [5]. The risks of ice machines are captured under the *Food Act 2008*.



Figure 12 Mould and rust in an ice machine

4.11 Public health risk assessment

Globally, public health is a high priority that in many situations requires legislation to define the roles and responsibilities of individuals, agencies and others, to protect public health by reducing the risk of public health harm or incident occurrence.

The Public Health Act introduces the term 'public health risk' which means 'a risk of harm to public health'. *Harm* is defined in the Act to mean 'physical or psychological harm to individuals, whether of long-term or immediate impact or effect'.

These definitions cover a range of potential public health risks including:

- physical e.g. noise, mechanical hazards and vibration
- chemical either naturally occurring or synthetic substances or
- biological e.g. viruses, bacteria and vermin.

The intention of regulations to be created under the Public Health Act is to ensure measures are in place to prevent, control or abate public health risks.

In order to assess the risks associated with air-handling and water systems, the application of a health risk assessment matrix is important to understand the severity of the risks the DOH and other enforcement agencies must protect the community from.

The main intention of regulations to be created under the Public Health Act is to ensure measures are in place to prevent, control or abate a public health risk.

The Environmental Health Directorate has adopted the risk assessment model provided by the [2011 Health Risk Assessment \(Scoping\) Guidelines, Department of Health WA](#). This model is based on the principles of the [Environmental health risk assessment: Guidelines for assessing human health risks from environmental hazards. enHealth, June 2012](#).

The application of this risk assessment model provides greater surety that risks are assessed in a systematic, consistent and transparent manner for different hazards across WA.

Table 3 below provides the foundation as to why certain management responses, such as a regulation or guideline, may be necessary for different levels of risk.

These risk levels are determined by applying a risk matrix model to the various risks associated with air-handling and water systems as outlined in Table 4.

Table 3 Definition of risk levels

Risk Level	DOH management requirements
Very Low Public Health Risk	No further assessment required
Low Public Health Risk	Some mitigation/management may be required – no detailed assessment of health hazards required but addressed with routine controls
Moderate/Medium Public Health Risk	Substantial mitigation/management required – assessment required of health hazards
High Public Health Risk	Not an acceptable risk. The DOH needs to be involved in the management of high public health risks. Major mitigation/management (including offsets) may be required – assessment required of health hazards
Extreme Public Health Risk	Potentially unacceptable: modification of proposal required

Table 4 summarises the:

- Public health risks related to Legionnaires' Disease
- Persons who are most at risk e.g. young, old, pregnant women, men, women, employees, people with disabilities
- Severity of the impact of the risk
- Likelihood of impact
- Risk level e.g. very low, low, moderate, high, extreme
- Current legislation in place to effectively deal with the risk.

Refer to [Appendix 2](#) for a summary of the risk matrix model applied in Table 4.

Table 4 Public health risk assessment of risks associated with Air-handling and water systems

Public Health Risk	Cause	Who is at risk	Severity of impact*	Likelihood of impact**	Risk Level***	Current legislation in place to deal with the public health risk
Death (<i>Legionella pneumophila</i> bacteria)	Inhalation of aerosols from dirty cooling towers and evaporative condensers, evaporative air conditioners, warm water systems, misting or droplet spray systems, spa pools and hydrotherapy pools, fountains	<ul style="list-style-type: none"> • are over 50 years old • are male • have a history of smoking • have heavy alcohol intake • have long term medical conditions that weaken the body's immune system (such as cancer, lung disease, diabetes, and transplant recipients) or • are on immunosuppressant drugs. 	Massive	Possible	High	<i>Health (Air-handling and Water Systems) Regulations 1994</i> <i>Health (Aquatic Facilities) Regulations 2007</i> <i>Occupational Safety and Health Act 1984</i>
Illness	Inhalation of aerosols from dirty cooling towers and evaporative condensers, evaporative air conditioners, warm water systems, misting or droplet spray systems, spa pools and hydrotherapy pools, fountains	<ul style="list-style-type: none"> • are over 50 years old; • are male • have a history of smoking • have heavy alcohol intake • have long term medical conditions that weaken the body's immune system (such as cancer, lung disease, diabetes, and transplant recipients); or • are on immunosuppressant drugs. 	Major	Possible	Medium	<i>Health (Air-handling and Water Systems) Regulations 1994</i> <i>Health (Aquatic Facilities) Regulations 2007</i> <i>Occupational Safety and Health Act 1984</i>

* Health consequence table adapted from the 2011 Health Risk Assessment (Scoping) Guidelines, Department of Health WA (refer to Appendix)

** Risk likelihood table adopted from the 2011 Health Risk Assessment (Scoping) Guidelines, Department of Health WA (refer to Appendix)

*** Final risk rating from the risk matrix (refer to Appendix)

When applying the risk assessment model ([Appendix 2](#)) to the risks associated with air-handling and warm water systems, summarised in Table 4, the assessment identified the following risk levels:

- **High Public Health Risk** - Not an acceptable risk. The DOH needs to be involved in the management of high public health risks. Major mitigation/management (including offsets) may be required – assessment required of health hazards
- **Medium Public Health Risk** - Substantial mitigation/management required – assessment required of health hazards.

This public health risk assessment indicates that stringent control measures are required by the DOH in order to effectively minimise the risk of harm to the public health of the WA community.

The Chief Health Officer has a responsibility to administer the Public Health Act in accordance with its objects and principles. One of the key objects of the Act is to protect individuals and communities from diseases and other public health risks and to provide, to the extent reasonably practicable, a healthy environment for all Western Australians.

Therefore, based on the high public health risks identified as part of the risk assessment process, the Chief Health Officer has a responsibility to the people of WA to ensure appropriate controls are in place to protect the community from risks related to air-handling and warm water systems

5 Current management of air-handling and water systems

5.1 Western Australia

5.1.1 Summary of management in WA



5.1.2 Health (Air-handling and Water Systems) Regulations 1994

Air-handling and water systems are managed under the *Health (Air-handling and Water Systems) Regulations 1994* (Air-handling Regulations).

The overall objectives of the Air-handling Regulations are to:

- Ensure the correct design, installation, operation and maintenance of air-handling and water systems and cooling towers installed in Western Australian buildings.

- Prevent outbreaks of Legionnaires' Disease from air-handling and water systems in Western Australia.
- Enable enforcement agencies to respond to potential outbreaks of Legionnaires' Disease by enforcing control measures.

The Air-handling Regulations were the first regulations developed to manage the public health risks associated with Legionnaires' Disease in WA.

The regulations came into operation on 24 September 1994 in response to a series of outbreaks of Legionnaires' Disease in the eastern states of Australia.

The regulations apply to all buildings across WA except those classified as a:

- Class 1 – single dwelling
- Class 2 – 2 or more sole occupancy units; or
- Class 10 – non-habitable building or structure (e.g. shed)

The Air-handling Regulations were the first regulations developed to manage the public health risks associated with Legionnaires' Disease in WA following an outbreak in the eastern states of Australia.

in accordance with the building classification scheme adopted under regulation 6 of the *Building Regulations 2012*. The Air-handling Regulations adopt the Australian Standards 3666 detailed in Table 5.

The Air-handling Regulations apply in respect of the design and installation of air-handling and water systems and cooling towers to be installed in buildings where the installation of the system occurs after the commencement of the regulations.

Table 5 Australian Standards adopted in the Air-handling Regulations

AS3666	Scope of Australian standard
Part 1 -	deals with design, installation and commissioning
Part 2 -	deals with the operation of systems that are able to be shut down for periodic maintenance. (e.g. hospital ring mains and water based air handling systems)
Part 3 -	deals with air handling and water systems that cannot be shut down for maintenance. These systems include large industrial types serving power stations, co-generation plants and refining plants.

The Air-handling Regulations currently adopt superseded versions of AS3666 including AS/NZS 3666.1:1995/Amdt 1 — 1996; AS/NZS 3666.2:1995; AS/NZS 3666.1:1995/Amdt 1 — 1996 and AS/NZS 3666.3:2000. These Australian Standards have been superseded by the 2011 versions which are not reflected in the Air-handling Regulations.

Key definitions of the Air-handling Regulations include:

- **air-handling system** means an air-handling system as defined in AS 3666 but does not include a dry system which does not use water or other liquids to operate, humidify, clean, maintain, heat or cool the air;
- **cooling tower** means a cooling tower as defined in AS 3666 and also means any other liquid cooled heat rejection or liquid cooling equipment;

- **water system** means a piped water system within a building designed to deliver water to outlet points.

Where a cooling tower cannot be closed down for maintenance, compliance with AS 3666 Part 3 is required, which requires a regime of regular testing for *Legionella* and heterotrophic plate counts.

Where a cooling tower or water system can be subjected to regular maintenance without closure of the facility, application of and compliance with the requirements contained within Part 2 of the Australian Standard AS 3666 is sufficient and periodic bacteriological sampling is not required.

If water testing for *Legionella* is undertaken, it should be supplementary to and not in place of good installation, upkeep and maintenance practices as prescribed by Australian Standard AS 3666. Reliance upon routine sampling for *Legionella* species as an indicator of the need to initiate maintenance procedures complies with neither the Australian Standard nor the existing legislative requirements.

5.1.3 Building Guidelines Western Australia Health Facility Guidelines for Engineering Services

The [Western Australia Health Facility Guidelines for Engineering Services](#) (the Guidelines) are the engineering design and operation guidelines for health facilities in Western Australia.

The Guidelines are presented in the form of minimum requirements. Mandatory requirements identified with the word “shall” are prescribed. The Guidelines apply to facilities built by the sector and hospitals and day procedure facilities as defined as hospitals by the *Private Hospitals and Health Services Act 1927*.

Compliance with the Guidelines is mandatory when designing and operating public and private health facilities in Western Australia. The Guidelines take primacy over any conflicting requirements in the Australasian Health Facility Guidelines. Compliance with the Guidelines is required when:

- a new facility is built
- an existing facility is altered
- a new health care service or procedure is introduced to an existing facility
- maintenance is carried out ensure compliance
- required by Licensing and Accreditation Regulatory Unit policy (such as facility change of ownership)

This Guideline provides some guidance on air-handling and ventilation systems but does not reference AS3666. There may be the possibility of updating this guideline to capture air-handling and warm water system requirements specific to hospitals and aged care facilities.

5.1.3.1 Role of the Department of Health

Operational services

The DOH has minimal operational and enforcement responsibilities related to air-handling and water systems. In principle, local government is the lead enforcement agency.

The Air-handling Regulations enable the Chief Health Officer (CHO) to close a system if it is likely to cause a serious risk to health. While there is no record of a system being closed by the CHO since the regulations commenced there has also been no outbreaks identified in WA. The contribution that existing Air-Handling Regulations have made to prevent outbreaks is difficult to measure (See Section 5.1.2.2).

5.1.3.2 Role of local government enforcement agencies

Local government enforcement agencies have a responsibility to enforce the Air-handling Regulations. Enforcement agencies appoint authorised officers who are responsible for ensuring enforcement and compliance with the legislation.

However, there have been significant inconsistencies across local governments in the enforcement of the Air-handling Regulations since their inception. At the time the Air-handling Regulations commenced in 1994, local government expressed concern that they had not been consulted about the administrative and enforcement responsibilities imposed on them in the new laws. The Air-handling Regulations did not initially enable local governments to recoup costs associated with administration and enforcement, resulting in poor application of the regulations. As a result, records of air-handling and water systems are not kept by all local government authorities and many are not involved in approving systems prior to installation.

The DOH [conducted a survey of WA local governments](#) in July 2017 to determine their level of enforcement of the Air-handling Regulations. These survey results, summarised in Table 6, indicate that the Air-handling Regulations are not being consistently or effectively enforced across WA - with most respondents not registering or keeping an active list of cooling towers and warm water systems within their jurisdiction.

Table 6 Summary of the local government compliance and enforcement survey, July 2017

Question	Responses
Do you register air-handling and water systems in accordance with the <i>Health (Air-handling and Water Systems) Regulations 1994</i> ?	Six out of 56 local governments indicated that they register, or are prepared to register, systems in their jurisdictions. 38 local governments stated that they did not register systems. However, it was implied that of those local governments that did not register systems, they may not have any systems within their jurisdiction that required registration.
Do you charge a fee for registration of air-handling and water systems?	Only two local governments, out of 56, prescribed a fee. However, only one local government actively had to apply this fee.
If you answered yes to either of the above: How many air-handling and water systems are registered with your local government?	Of the six local governments that stated that they register systems, only two metropolitan local governments could state how many were registered – which included 19 and five cooling towers respectively.
How much is your fee for registration in the 2016/2017 financial year?	Only two local governments prescribed a fee, being \$180 and \$284 respectively.
How many complaints have you received related to air-handling and water systems?	No local governments indicated that they had received any complaints related to air-handling and warm water systems during the 2016/2017 financial year. However, this is not considered to be a reliable indicator that air-handling and warm water systems are being effectively maintained. Members of the public are generally not allowed to access areas where cooling towers are located and cannot see the conditions of the system.

The requirements of the Air-handling Regulations and the responsibilities of local government are summarised in Table 7. There are no auditing or inspection requirements specified in the Air-handling Regulations.

Table 7 Enforcement responsibilities of local government under the Air-handling Regulations

Powers applicable to local government	Specific details/requirements
Regulation 7 Assessment and written approval of air-handling and water systems	<ul style="list-style-type: none"> ▪ Any person who proposes to install or modify an air-handling system, water system or cooling tower must submit an application for assessment by the responsible local government. ▪ The application must include specific information including type, design, plans and wind pattern information. ▪ Local governments are required to assess each application against the information provided and the AS 3666.
Regulation 8 Ability to refuse to grant approval	<ul style="list-style-type: none"> ▪ If the local government is not satisfied with the application and the design and installation requirements, they have the power to refuse the application and not allow the installation.
Regulation 11 Prevent the use of unsuitable materials for construction	<ul style="list-style-type: none"> ▪ If the local government is satisfied that any material is or may be unsafe for the purposes of use in an air-handling system, water system or cooling tower the local government may, with the written approval of the Chief Health Officer, direct that the material must not be used in the construction of such a system.
Regulation 12 Closure of systems	<ul style="list-style-type: none"> ▪ A local government or the Chief Health Officer may close an air-handling system, water system or cooling tower if the system could cause a serious risk to health. ▪ Local governments must notify the Chief Health Officer of the closure.
Regulation 16 Offences	<ul style="list-style-type: none"> ▪ A person who contravenes or fails to comply with any of the provisions of the regulations commits an offence.

Authorised officer skills and knowledge

Due to the absence of provisions in the existing Air-handling Regulations for adequate auditing and inspection requirements by local government, significant training and support would be required to up-skill authorised officers in undertaking any future enforcement responsibilities. Currently, authorised officers are likely to become involved when an investigation of a notifiable case of *Legionella pneumophila* is undertaken where they assist by identifying and sampling suspected sources.

5.1.3.3 Requirements for industry

There are a number of requirements that industry must adhere to under the Air-handling Regulations. Depending on whether the cooling water system can be shut down for periodic cleaning and maintenance, industry may choose to comply with either AS3666 Part 2 or AS3666 Part 3. Part 2 requires shutdown of cooling water systems for periodic cleaning and maintenance. This may be impractical for many systems, such as large industrial types serving power stations, co-generation plants, oil refineries and chemical manufacturing plants, who may comply with Part 3.

The key requirements of compliance with the Air-handling Regulations are summarised in Tables 8 and 9.

Significant training and support would be required to up-skill authorised officers to undertake any future enforcement responsibilities that may be proposed under any new legislation.

Table 8 Requirements for industry in accordance with the Air-handling Regulations

Requirement of the Air-handling Regulations applicable to industry
<p>Regulation 7</p> <p>Submit an application to local government prior to installing or modifying an air-handling system, water system or cooling tower.</p> <p>The application must include:</p> <ul style="list-style-type: none"> (a) details of the type, design, layout and location of the air-handling system or cooling tower; (b) the location of air inlets and air exhausts, including windows which open; (c) the direction of the prevailing winds and localised wind patterns; (d) the location and design of other inlets and discharges which may effect or be effected by the proposed installation; and (e) the position and type of any proposed developments in the vicinity of the installation of which the local government have received notice.
<p>Regulation 10</p> <p>Control of liquids and dust</p> <p>The owner or occupier of a building must ensure that —</p> <ul style="list-style-type: none"> a) any liquids discharged in the course of operation or maintenance carried out under these regulations are directed to and discharged into a sewer or other waste system approved by the local government and any other relevant authority; b) any aerosols, dust or particulate matter generated during operation or maintenance are not allowed to contaminate adjoining areas and the ambient environment; and c) unless authorised by the owner or occupier, public access to any area referred to in paragraph (b) is prohibited.

Table 9 Key requirements for industry under the Australian Standards 3666

Part 2: Operation and maintenance
<p>Key requirements include:</p> <ul style="list-style-type: none"> • Ensure all equipment and components are serviced and maintained • Ensure equipment can be easily and safely accessed for cleaning, inspection and maintenance • Ensure cooling towers are inspected at least monthly as part of a regular maintenance program and cleaned when necessary. Cleaning intervals shall not exceed 6 months • Require operating and maintenance manuals to be provided for all equipment and systems • Keep up to date maintenance reports and log book and ensure all records are readily available for inspection by an enforcement agency • Where a system has not been in operation for more than 30 days, an assessment in accordance with clauses 3.2 to 3.5 shall be carried out within three to seven days of system operation.
Part 3: Performance-based maintenance of cooling water systems
<p>Key requirements include:</p> <ul style="list-style-type: none"> • Taking a representative sample of cooling water at least once a month when the system is in use and test for legionella • Taking a representative sample of cooling water at least once a month when the system is in use and test for heterotrophic microorganisms counts • Initiate control strategies when: <ul style="list-style-type: none"> ○ Legionella is detected >10 cfu/100ml ○ Heterotrophic microorganisms detected >100 000cfu/100ml • Produce reports detailing test results.

A discussion with WA industry representatives has highlighted concerns about the potential public liability implications that may result from an outbreak of Legionnaires' Disease from their facilities. The public liability costs alone can be the impetus for some of the larger facilities (e.g. hospitals, shopping centres) to ensure they are complying with best practice standards.

One of the key requirements of AS3666 Part 3 is to ensure sampling for legionella and heterotrophic plate counts is conducted on a monthly basis while the system is in use. The associated costs may include:

- Legionella ~ \$70 per sample
- Heterotrophic plate count ~ \$70 per sample.

The number of samples per cooling tower is not specified in the Australian Standards, however, it must be representative of the system. The above costs are based on the average cost of processing a sample with the PathWest testing laboratory of WA. It is not known how many Legionella samples are collected by industry each year because this information is not collected centrally or easily accessible.

5.1.3.4 Number of air-handling systems in WA

It is unknown exactly how many air-handling systems (e.g. cooling towers) are located throughout WA. A survey of local governments during July 2017 (summarised in Table 6) was unsuccessful in identifying the exact number of registered systems.

The Victorian Department of Human Services is the only State Government agency that centralises the registration of cooling towers. As of August 2017, Victoria has 3,215 cooling tower systems registered for a total of 1,907 sites across Victoria.

As an estimate on the number of cooling towers that may be located throughout WA, a review of common buildings that are likely to have a cooling tower installed on site was undertaken (summarised in Table 10) including hotels, shopping centres, office buildings, universities, hospitals and aged care facilities. An estimated 3,192 sites may have one or more cooling tower on site that may need to be registered. However, this is likely to be a significant overestimation of the total number of sites.

Table 10 Estimated number of premises that may potentially be fitted with a cooling tower

Premises type	Estimated number in WA	Notes
Hotels	~622	The total of 1557 was taken from the number of hotels on Booking.com for WA. As an estimate, 40% of these buildings may have a cooling tower.
Shopping centres	214	Source: shopping centres, malls, villages, arcades listed on https://www.yellowpages.com.au/wa/shopping-centres-malls-33839-category-a1.html
Office buildings	1950	There are around 1,950 office buildings spread out across metropolitan Perth [16]. LGA's which have a significant proportion of office stock are the City of Subiaco (Subiaco), City of Stirling (Herdsman/Osborne Park), City of Fremantle (Fremantle), City of South Perth (South Perth), City of Belmont (Belmont) and the City of Vincent (Leederville, North Perth and Mount Lawley/Highgate). Each of these LGA's has over 50,000 square metres of office space [17], which we can assume would be mid-tier. It is not known how many office buildings are located regionally [15].
Universities	10	Source: https://universityreviews.com.au/list-of-universities/perth-western-australia/

Premises type	Estimated number in WA	Notes
Hospitals – public and private (metropolitan)	78	Source: www.myhospitals.gov.au www.agedcareonline.com.au
Hospitals – regional	36	Source: www.myhospitals.gov.au www.agedcareonline.com.au
Aged care facilities	~282	www.agedcareonline.com.au
TOTAL (estimate)	3,192	

5.1.3.5 Number of warm water systems in WA

It is not known exactly how many warm water systems are located throughout WA.

After reviewing high risk facilities (e.g. hospitals and aged care facilities) where a warm water system may come into contact with vulnerable high risk people, it is estimated that approximately 396 sites may be impacted by the current or future legislation based on Table 11.

There are an estimated 396 health and aged care facilities with a warm water system that may need to be registered in WA.

Table 11 Estimated number of vulnerable premises that may potentially be fitted with a warm water system

Premises type	Estimated number in WA	Notes
Hospitals – public and private (metropolitan)	78	Source: www.myhospitals.gov.au www.agedcareonline.com.au
Hospitals –regional	36	Source: www.myhospitals.gov.au www.agedcareonline.com.au
Aged care facilities	~282	www.agedcareonline.com.au
TOTAL (estimate)	396	

5.1.3.6 Role of public / consumers

There are no responsibilities for the general public under the Air-handling Regulations.

5.1.3.7 Limitations of the Air-handling Regulations 1994

A review of the Air-handling Regulations has identified a number of shortcomings including:

- No requirement for local government to keep an up-to-date list of cooling tower locations
- No specified details for annual registration requirements
- No ability to issue infringement notices
- No requirement for industry to notify an enforcement agency of elevated legionella or heterotrophic plate counts
- No inspection or auditing requirements and other compliance checks
- No risk based / management approach
- Adoption of superseded Australian Standards.

5.1.4 Occupational Safety and Health

The [Code of Practice - Prevention and control of Legionnaires' Disease 2010](#) was issued by the Commission for Occupational Safety and Health (the Commission) and its Mining Industry

Advisory Committee under the provisions of the [Occupational Safety and Health Act 1984](#) (WA) (the OSH Act) and the [Mines Safety and Inspection Act 1994](#) (WA) (the MSI Act).

In June 2010, the WA Minister for Commerce approved this code of practice under section 57 of the OSH Act and in July 2010, the Minister for Mines and Petroleum approved this code of practice under section 93 of the MSI Act. It applies to all workplaces in Western Australia covered by either the OSH Act or the MSI Act. The code provides general guidance for employers, people in control of workplaces, designers, manufacturers, suppliers and workers on the identification and control of safety and health hazards and risks associated with Legionnaires' Disease; and information on the key requirements in the OSH and MSI legislation with respect to Legionnaires' Disease.

The code of practice is a document prepared for the purpose of providing:

- practical guidance on how to comply with a general duty under the OSH Act and MSI Act or specific duties under the OSH Regulations and MSI Regulations
- non-prescriptive, practical guidance on safe work practices that can be used to reduce the risk of work-related injury and disease and
- a practical means of following any code, standard, rule, provision or specification relating to occupational safety and health in Western Australia.

A code of practice may contain explanatory information. However, the work practices included may not represent the only acceptable means of achieving the standard to which the code refers. Compliance with codes of practice is not mandatory, but a code may be considered by the courts as the standard when assessing other methods or practices used. A code of practice does not have the same legal force as a regulation and non-compliance is not sufficient reason, of itself, for prosecution under the OSH Act or MSI Act [16].

Compliance with OSH codes of practice is not mandatory, but a code may be considered by the courts as the standard when assessing other methods or practices used. A code of practice does not have the same legal force as a regulation and non-compliance is not sufficient reason, of itself, for prosecution.

Role of Worksafe WA

The OSH Act requires employers to investigate injuries within a reasonable time, determine action (if any) and notify the employee who reported the injury of the outcome of the investigation. Where an employee complains to Worksafe WA, Worksafe officers may do an on-site investigation of occupational diseases including cases of Legionnaires' Disease. Worksafe do not routinely audit systems.

5.1.5 Building Code of Australia

The Building Code of Australia (BCA) contains technical provisions for the design and construction of buildings and other structures, covering such matters as structure, fire resistance, access and egress, services and equipment and energy efficiency as well as certain aspects of health and amenity. In WA, the BCA is adopted through the [Building Act 2011](#) and the [Building Regulations 2012](#).

The BCA includes the issue of ventilation and providing healthy air to breath. However, the BCA is not concerned with the post installation and handover health implications of systems.

Clause F4.5 of BCA Volume One requires a mechanical ventilation or air-conditioning system to comply with AS/NZS 3666.1 (and AS 1668.2), where installed in lieu of natural ventilation complying with Clause F4.6.

Clause F2.7 of BCA Volume One also requires hot water, warm water and cooling water systems to be installed in accordance with AS/NZS 3666.1. This does not apply to a system serving only a sole occupancy unit in a Class 2 or 3 building or Class 4.

The *Buildings Regulations 2012*, r48A, requires maintenance of air handling and warm water systems. However, the regulations do not specify any standards that must be complied with, or require ongoing compliance and auditing checks to protect public health.

Where a cooling tower system forms part of the mechanical ventilation system or air-conditioning system, it is necessary to specifically check the location of the cooling tower in relation to air intakes, air exhausts and drift control measures, in accordance with AS/NZS 3666.1.

Warm water systems should also be checked for compliance with AS/NZS 3666.1. Alternatively, the applicant may choose to provide a “Certificate of Compliance — Design” from a suitably qualified building practitioner in relation to the system.

The BCA only applies to new building work incorporating a cooling tower or warm water system. It does not address renovation or replacement of a system in the future [17]. Regulation 48A of the *Building Regulations 2012* relates to the maintenance of buildings which apply to air handling systems and warm water systems (as summarised in Table 12). However, the *Building Regulations 2012* do not adopt any particular maintenance standards that must be complied with or other public health related considerations. Additionally, there are no ongoing compliance checks or third party auditing to ensure a building is complying with relevant maintenance and operational standards to protect public health.

Table 12 Requirements of the *Building Regulations 2012* and Building Code of Australia

Building standards	Requirements
Building Regulations 2012	<p>48A. Maintenance of buildings</p> <p>(2)The owner of an existing building that is a Class 2 to Class 9 building must ensure that —</p> <p>(a) the safety measures in each part of the building are capable of performing to a standard set out in the relevant building standards for the part; and</p> <p>(b) the mechanical ventilation, hot water, warm water and cooling water systems are adequately maintained to safeguard people from illness or injury;</p>
Building Code of Australia	<p>F2.7 Microbial (legionella) control <i>NSW F2.7</i></p> <p>Hot water, warm water and cooling water systems in a building other than a system serving only a single <i>sole-occupancy unit</i> in a Class 2 or 3 building or Class 4 part of a building must be installed in accordance with AS/NZS 3666.1.</p>
Building Code of Australia	<p>F4.5 Ventilation of rooms</p> <p>A <i>habitable room</i>, office, shop, factory, workroom, <i>sanitary compartment</i>, bathroom, shower room, laundry and any other room occupied by a person for any purpose must have—</p> <p>(a) natural ventilation complying with F4.6; or</p> <p>(b) a mechanical ventilation or air-conditioning system complying with AS 1668.2 and AS/NZS 3666.1.</p>

Department of Water

The Department of Water has issued the “[Cooling tower wastewater management and disposal guideline](#)” which addresses the discharge issues of cooling tower wastewater that may potentially pose a risk of contamination to natural water bodies.

The Department of Water is responsible for managing and protecting the State’s water resources. It is also a lead agency for water conservation and reuse [18]. The Department of Water has no regulatory requirements or involvement in the installation or ongoing maintenance of cooling towers.

5.1.6 enHealth Guidelines for Legionella Control

The Environmental Health Committee (enHealth) is a national body responsible for providing agreed environmental health policy advice, consultation with key stakeholders and the development and coordination of research, information and practical resources on environmental health matters at a national level. The development of national advice by enHealth is based on significant collaboration and consultation with Federal, State and Territory agencies, departments and organisations that deal with environmental health matters. The enHealth membership includes representatives from Commonwealth, State and Territory health departments, the New Zealand Ministry of Health and the National Health and Medical Research Council.

In 2016 enHealth released the [Guidelines for Legionella Control \(2016\)](#), following a number of outbreaks of Legionnaires’ Disease in water distribution systems in public hospitals. The design and function of the water distribution system within a health or an aged care facility can affect the potential health risks posed by Legionella within the facility.

The guidelines are designed to assist facility managers to assess and manage the risk from Legionella in health and aged care facilities. They are aimed at facility managers and the facility’s risk management team to support the development of a Legionella risk management plan. A plan template is also available.

The guidelines and template are provided as non-prescriptive guidance materials only and where appropriate, they should be adapted to fit with existing facility risk management processes and regulatory requirements. Although the principal focus of these guidelines is *Legionella pneumophila*, the advice provided about its control will also result in effective control of other Legionella species and many other microbial hazards that can be present in the water infrastructure of health and aged care facilities.

These guidelines apply to all water distribution systems in health and aged care facilities with the exception of cooling towers, which are not within the scope of this document. Facility managers should consult relevant State or Territory legislation and guidelines for the management and control of Legionella in cooling towers.

A number of Australian jurisdictions are taking measures to formally adopt the principles of these guidelines within legislation, which require vulnerable facilities such as health and aged care facilities to:

- develop a risk management plan
- ensure the risk management plan is independently audited each year
- require baseline sampling for legionella and heterotrophic plate counts.

5.1.7 Public health complaints and enquiries

The DOH does not generally receive direct complaints from the public regarding commercial cooling towers and other air-handling and water systems. This is mostly attributed to the fact

that the general public do not have access to these systems when entering a commercial building and would not be able to visibly see the condition of such systems.

The only concerns the DOH may receive are from someone who may have contracted the disease or from concerned relatives wanting to know more about where the person may have contracted the disease, to ensure the source of infection has been eliminated.

The DOH may undertake sampling of suspect systems to determine if they are contaminated with *Legionella* bacteria. Table 13 details the number of legionella bacteria samples collected and funded by the DOH for testing for legionella sources between 2013 to 2015.

Table 13 Legionella water samples collected by the DOH

Number and type of water monitoring samples collected	2013-14	2014-15
Legionella monitoring of air-handling and warm water systems	57	54

5.2 National legislation

The following table (Table 14) summarises the current management of air-handling and water systems in key Australian jurisdictions. Controls vary across Australia.

Table 14 Legislative controls in Australia for cooling towers and warm water systems

Legislative requirements	Summary
<p>Victoria</p> <ul style="list-style-type: none"> • Cooling tower systems and warm water systems are governed by the Public Health and Wellbeing Act 2008 and the • Public Health and Wellbeing Regulations 2009. 	<p>Victoria Health centralises the registration of cooling towers and employs 3 FTE positions to inspect these systems each year. There are currently 3,215 cooling tower systems registered on 1,907 sites across Victoria. Victoria Health are funded to undertake 1,000 inspections each year and they focus inspections on sites that are associated with cases of Legionnaires' Disease, that have failed their annual audit, have not had an annual audit or have failed to register / renew their registration.</p> <p>The <i>Public Health and Wellbeing Act 2008</i> and the <i>Public Health and Wellbeing Regulations 2009</i> commenced on 1 January 2010. The following is a summary of the changes introduced by the legislation:</p> <ul style="list-style-type: none"> ▪ Registration of a cooling tower system is done by the Department of Health rather than the Building Commission. ▪ Penalties for failing to register a cooling tower system have been increased significantly. ▪ Registration periods can now be up to 3 years. ▪ Risk management plans must include the steps that are being taken to comply with the maintenance and testing requirements (including remedial action following an adverse test result). ▪ The HCC trigger level for action was increased to 200,000 cfu/mL and there is now an alternative process which can be followed when a high HCC result is obtained. ▪ There is a mandatory requirement for a minimum of a <i>Legionella</i> test every 3 months. The Department still strongly recommends the risk management approach, which in most cases will result in an increased level of testing reflecting the risks associated with particular systems and sites. <p>The owner of the land on which there is a cooling tower system is to ensure that each cooling tower system on that land is registered with the department at all times that the system is in operation.</p>

	<p>The registration holder must notify the department within 30 days of:</p> <ul style="list-style-type: none"> ▪ a change in the ownership of the land ▪ a change in mailing address or contact details ▪ a change in the numbers of cooling towers in a cooling tower system ▪ the removal or decommissioning of the cooling tower system ▪ the relocation of the cooling tower system on land.
<p>New South Wales</p> <p>Regulation</p> <ul style="list-style-type: none"> • Public Health Act 2010, Legionella Control • Public Health Regulation 2012 - Legionella Control <p>Code / guide</p> <ul style="list-style-type: none"> • Code of Practice for the Control of Legionnaires' Disease 2nd Edition 2004, NSW - currently under review. • Water - Requirements for the Provision of Cold and Heated Water - Policy Directive PD2015_008 • Legionnaires' Disease - Control for Building Owners and Occupiers Factsheet • Legionnaires' Disease - Control Guideline for Public Health Units 	<p>The <i>Public Health Act 2010</i> and the <i>Public Health Regulation 2012</i> control various artificial environments and systems which are conducive to the growth of <i>Legionella</i> organisms and which are capable, under the right conditions, of transmitting Legionnaires' Disease. These regulated systems include:</p> <ul style="list-style-type: none"> ▪ water cooling systems ▪ hot water systems ▪ warm water systems ▪ air handling systems. <p>Exemptions Some systems are exempt - including those in a dwelling, warm water systems in any premises other than a hospital, or cooling systems used for making snow.</p> <p>Installation requirements</p> <ul style="list-style-type: none"> ▪ Installed in accordance with AS3666.1:2011 <p>Operating requirements</p> <ul style="list-style-type: none"> ▪ Operation in accordance with AS3666.2:2011 <p>Maintenance precautions</p> <ul style="list-style-type: none"> ▪ Maintenance in accordance with AS3666.2:2011 ▪ Warm water systems must be maintained in accordance with a separate NSW guideline. ▪ Prescribed penalties e.g. for not maintaining appropriately or allowing persons to access area in which maintenance is being carried out. <p>Certification</p> <ul style="list-style-type: none"> ▪ The occupier of a premises must ensure the water-cooling system is certified annually by a competent person and keep a copy to show an authorised officer if requested. <p>Registration</p> <ul style="list-style-type: none"> ▪ The occupier of a premises must notify local government of the installation of water cooling and warm water systems. ▪ Each local government to keep a register of water cooling and warm water systems. <p>Training in Legionella control in cooling water systems</p> <ul style="list-style-type: none"> ▪ NSW Health has developed a training course on Legionella Control in Cooling Water Systems together with TAFE NSW. The course provides an overview of the science relating to Legionnaires' disease outbreaks, cooling water system management, and the roles, responsibilities, and requirements under Regulations. <p>Additional amendments In 2008 NSW Health amended the Regulation to include six key requirements or "safeguards" as part of the risk management approach. This includes:</p> <ol style="list-style-type: none"> 1. assessing risk of <i>Legionella</i> contamination and preparing a Risk

	<p>Management Plan (RMP) – every 5 years (or more frequently if required)</p> <ol style="list-style-type: none"> 2. independent auditing of compliance with the RMP and Regulation – every year 3. providing certificates of RMP completion and audit completion to the local government authority 4. sampling and testing for <i>Legionella</i> and heterotrophic colony count – every month 5. notifying reportable laboratory test results (<i>Legionella</i> count $\geq 1,000$ cfu/mL or heterotrophic colony count $\geq 5,000,000$ cfu/mL) to the local government authority 6. displaying unique identification numbers on all cooling towers.
<p>South Australia</p> <ul style="list-style-type: none"> • South Australian Public Health (Legionella) Regulations 2013 • Guidelines for the Control of Legionella in Manufactured Water Systems in South Australia (PDF 270KB) 	<p>Issues addressed by the regulations include:</p> <ul style="list-style-type: none"> ▪ Duty to register high risk manufactured water system ▪ Register of high risk manufactured water systems ▪ Cooling water systems to be fitted with automatic biocide dosing devices ▪ Cooling water systems to be fitted with drift eliminators ▪ Commissioning of high risk manufactured water systems ▪ Plans and manuals relating to high risk manufactured water systems to be kept readily accessible etc ▪ High risk manufactured water systems to be operated and maintained by competent persons ▪ Maintenance of cooling water systems ▪ Maintenance of warm water systems ▪ Maintenance log books ▪ Annual inspection and microbiological testing ▪ Power of relevant authority to require microbiological testing in other circumstances ▪ Responses to detection of Legionella ▪ Determinations and approvals ▪ False or misleading statements ▪ Prescribed guidelines ▪ Fees. <p>The Regulations apply to the owner(s) of all warm water system(s) and/or cooling water system(s), except for systems installed in:</p> <ul style="list-style-type: none"> ▪ a Class 1A, 4 or 10 building (private single domestic dwelling) under the Building Code, or ▪ a sole occupancy unit in a class 2 building (unit or flat) under the Building Code, provided that it is not a warm water system that serves more than one dwelling. <p>Registration</p> <p>All high risk manufactured water systems installed in premises must be registered with the relevant authority.</p> <p>'High risk manufactured water system' or 'system' mean a cooling water system or warm water system. Applications are with the local authority and last for a 12 month period.</p> <p>Fees</p> <p>The following fees relate to high risk manufactured water systems from 1 July 2016:</p> <ul style="list-style-type: none"> ▪ Registration - \$36.25 for the first system, \$24.30 for each subsequent system installed on the same premises ▪ Renewal - \$18.20 per system

	<ul style="list-style-type: none"> ▪ Inspection - \$145.00 for the first system, \$96.50 for each subsequent system installed on the same premises ▪ Determination or approval - \$606.00. <p>Inspections</p> <p>The Legionella Regulations require system owners to conduct monthly inspections of regulated systems and ensure periodic preventative maintenance is performed as prescribed.</p> <p>Annual inspection and microbiological testing</p> <p>Environmental health officers from the relevant authority (for example, the local council) must ensure all regulated systems are inspected at least annually and may inspect systems at any time in relation to disease investigations, reports of non-compliance, Legionella detection or complaints.</p> <p>The relevant authority is not required to comply with subregulation (1) (annual inspection and microbiological testing) if the relevant authority, at least once in every 12 months, gives the owner of each of the premises on which a high risk manufactured water system registered with the relevant authority is installed written notice requiring the owner to cause an inspection of the water system to be carried out by a competent person.</p>
<p>Queensland</p> <ul style="list-style-type: none"> • <i>Work Health and Safety Act 2011</i> • Guide to Legionella control in cooling water systems, including cooling towers (PDF 196 KB). 	<ul style="list-style-type: none"> ▪ Service contractors, designers or owners of cooling water systems are required to use the guidelines to manage risks associated with <i>Legionella</i>. ▪ The guidelines state that one of the best ways to protect the public from <i>Legionella</i> is to ensure that all plumbing work complies with relevant plumbing codes and standards.
<p>ACT</p> <ul style="list-style-type: none"> • Public Health Act 1997 • ACT Code of Practice for Public Health (Cooling Towers, Evaporative Condensers and Warm Water Storage Systems Specialised Systems) 2005 	<ul style="list-style-type: none"> ▪ The <i>Public Health Act 1997</i> and the Code of Practice are intended to minimise the potential risks to public health from exposure to Legionella bacteria by: <ul style="list-style-type: none"> • adopting standards for the design, location, commissioning, operation and maintenance of specialised systems at premises; • requiring regular maintenance, inspection and record keeping by trained or competent personnel to ensure that specialised systems at premises meet the standards; and • permitting Public Health Officers to check compliance, take samples for testing and the Chief Health Officer to require the closure of any specialised systems or require the evacuation of a premises where a suspected outbreak of Legionellosis has occurred. ▪ The Code of Practice sets out the minimum requirements for the operation and maintenance of specialised systems at premises in the Australian Capital Territory. The Code of Practice is determined under section 133 of the <i>Public Health Act 1997</i> and is enforceable under section 20 of the Act. ▪ The <i>Public Health Act 1997</i> states that a person may apply to the Minister for a registration to carry on a registrable public health risk activity. The operation of a specialised system is declared to be a location-specific registrable public health risk activity that may result in the transmission of disease to the community. Upon approval by a Public Health Officer, a registration certificate is issued for each specialised system (cooling tower, evaporative condenser or warm water storage system).
<p>enHealth</p> <ul style="list-style-type: none"> • Guidelines for Legionella control in the operation and maintenance of water 	<ul style="list-style-type: none"> ▪ In 2016 enHealth released the Guidelines for Legionella Control (2016), following a number of outbreaks of Legionnaires' Disease in water distribution systems in public hospitals. The design and function of the water distribution system within a health or an aged

<p>distribution systems in health and aged care facilities</p> <ul style="list-style-type: none"> • Risk management plan for Legionella Control in the operation and maintenance of the water systems 	<p>care facility can affect the potential health risks posed by Legionella within the facility.</p> <ul style="list-style-type: none"> ▪ The guidelines are designed to assist facility managers to assess and manage the risk from Legionella in health and aged care facilities. They are aimed at facility managers and the facility's risk management team to support the development of a <i>Legionella</i> risk management plan. A plan template is also available. ▪ In March 2016, the "WA Management of Legionella in Warm Water Systems in HealthCare Establishments Working Group" adopted the enHealth Legionella Guidelines and Risk Management Template as best practice. However, this has not yet been officially communicated to the healthcare industry.
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5.2.1 Lessons learnt

As part of this review, various States and Territories were contacted to determine whether their existing regulatory controls were effective in controlling the risk, and if there were any lessons to be learnt. These have been summarised in [Appendix 3](#).

5.3 International legislation

A review was undertaken on how public health risks associated with Legionnaires' Disease are managed internationally including in New Zealand, New York and the United Kingdom.

New Zealand

Table 15 New Zealand management of Legionnaires' Disease risks

Regulation / Code of Practice/ Guidelines	Comments / overview
<p>The Prevention of Legionellosis in New Zealand: Guidelines for the Control of Legionella Bacteria available from the Ministry of Health</p>	<p>This document is intended for use by building owners and managers whose buildings incorporate the systems and specific items of equipment mentioned in these guidelines, as well as by health protection staff when advising or following up identified cases.</p> <p>Legionella is a notifiable disease under the <i>Health Act 1956</i>. Health professionals and all medical laboratories (since December 2007) are required to inform their local Medical Officer of Health of the District Health Board (DHB) of any case of legionella either suspected on clinical grounds or established on both clinical grounds and positive laboratory tests.</p> <p>Councils are required to follow the regulations established under the <i>Building Act 2004</i> to ensure buildings are safe and healthy. They administer and enforce the building warrant of fitness regime under the <i>Building Act 2004</i>. This identifies safety systems and features present in a building (such as sprinkler systems, lifts or cooling towers), the performance standards for those systems, and how they will be monitored and maintained to ensure they continue to function safely.</p> <p>Compliance schedules made under section 22 of the <i>Building Act 2004</i> specify inspection, maintenance and reporting procedures for mechanical ventilation and air conditioning systems, to ensure compliance with the New Zealand Building Code. For a building to comply with the Building Code, the territorial authority (or other building consent authority) will issue a 'compliance schedule' itemising all specified systems in the building, as found in the <i>Building (Specified Systems, Change of Use, Earthquake Prone Buildings) Regulations 2005</i>. Mechanical ventilation and air conditioning systems are specified under these regulations [19].</p>

New York

Table 16 New York management of Legionnaires' Disease risks

Regulation / Code of Practice/ Guidelines	Comments / overview
<p>Part 4 - Protection Against Legionella</p> <p>Public Health Law, Section 225(5)(a)</p>	<p>Under the regulations, owners of cooling towers must:</p> <ul style="list-style-type: none"> ▪ Register cooling towers in a State-wide electronic system. New towers must be registered prior to initial operation and all tower registrations must be updated in the system whenever ownership changes. ▪ Inspect cooling towers prior to seasonal start-up, following maintenance, and at intervals no greater than 90 days while in use. The purpose of the inspection is to check for deficiencies or problems. ▪ Have an updated maintenance program and plan that includes a schedule for routine bacteriological culture sampling, routine <i>Legionella</i> culture sampling and analysis, and immediate <i>Legionella</i> culture sampling and analysis under specific conditions. ▪ Conduct <i>Legionella</i> culture sampling and analysis within two weeks after start-up for seasonal towers or within two weeks of start-up following maintenance for year-round towers and at intervals not to be greater than 90 days thereafter. <i>Legionella</i> culture sampling and analysis is required where New York State Department of Health (NYSDOH) or a local health department determines that one or more cases of legionellosis is or may be associated with a cooling tower. Bacterial culture sampling and analysis must be conducted at intervals not to exceed 30 days while the cooling tower is in use. ▪ Use a laboratory approved by NYSDOH to perform <i>Legionella</i> culture analyses. ▪ Respond appropriately to any elevated <i>Legionella</i> culture sampling results. ▪ Notify the local health department within 24 hours of getting a <i>Legionella</i> culture sample result exceeding 1,000 colony-forming units (CFU) per millilitre (mL). ▪ Use only pesticide applicators or technicians certified by the state Department of Environmental Conservation to apply biocides for disinfection. ▪ Certify by November 1st each year that a cooling tower has a maintenance plan, that it has been followed and that all requirements of the regulations have been met. <p>The new regulations also require hospitals and residential health care facilities to:</p> <ul style="list-style-type: none"> ▪ Perform or update an environmental assessment. The purpose of this assessment is to evaluate the building and the potable water systems, and identify sampling locations. ▪ Adopt and implement a sampling and management plan for potable water systems, which includes routine <i>Legionella</i> culture sampling and analysis and immediate <i>Legionella</i> sampling and analysis under specific conditions, including where NYSDOH determines that one or more cases of legionellosis is or may be associated with the facility. ▪ Conduct <i>Legionella</i> culture sampling and analysis at intervals no greater than 90 days for the first year and annually thereafter. Potable water systems that serve stem cell or organ transplant patients must be sampled and analysed at intervals not to exceed 90 days. ▪ Use a laboratory approved by NYSDOH to do <i>Legionella</i> culture analyses [12].

United Kingdom

Table 17 United Kingdom management of Legionnaires' Disease risks

Regulation / Code of Practice/ Guidelines	Comments / overview
Notification of Cooling Towers and Evaporative Condensers Regulations 1992	<ul style="list-style-type: none"> ▪ The <i>Notification of Cooling Towers and Evaporative Condensers Regulations 1992</i> require the notification of wet cooling towers and evaporative condensers to local authorities in whose area the equipment is situated, regardless of whether the local authority or Health and Safety (Executive) is the enforcing authority. ▪ The Regulations also require notification to the local authority of the closure of the device.
Health and Safety at Work etc Act 1974 (HSWA)	<ul style="list-style-type: none"> ▪ The <i>Health and Safety at Work etc Act 1974</i> (also referred to as HSWA, the HSW Act, the 1974 Act or HASAWA) is the primary piece of legislation covering occupational health and safety in Great Britain. The Health and Safety Executive, with local authorities (and other enforcing authorities) is responsible for enforcing the Act and a number of other Acts and Statutory Instruments relevant to the working environment. ▪ Duties under the <i>Health and Safety at Work etc Act 1974</i> extend to risks from legionella bacteria, which may arise from work activities. <i>The Management of Health and Safety at Work Regulations 1999</i> (MHSWR) provide a broad framework for controlling health and safety at work. More specifically, <i>the Control of Substances Hazardous to Health Regulations 2002</i> provide a framework of actions designed to assess, prevent or control the risk from bacteria like Legionella and take suitable precautions. The Approved Code of Practice: Legionnaires' Disease: The control of Legionella bacteria in water systems (L8) contains practical guidance on how to manage and control the risks in a system [20].

6 Cost impacts

The DOH has undertaken an assessment to quantify the cost impacts of no regulatory controls or preventative strategies to prevent a Legionnaires' Disease outbreak in WA, versus the cost impacts of current and potentially new regulatory measures to prevent or minimise an outbreak.

6.1 Costs without any regulatory controls

To explore the cost implications of taking no regulatory action to control a Legionnaires' Disease, an outbreak modelling scenario is considered below that is based on a single public facility not undertaking the appropriate maintenance in accordance with the current AS/NZS 3666 series, leading to an outbreak of 100 cases of Legionnaires' Disease in WA [21].

Scenario

- 100 people contract Legionnaires' Disease in WA
- 10 people die (based on a known death rate of 5-10% for a *Legionella* outbreak)
- 90 people spend 2 weeks in hospital being treated, and a further 3 weeks recovering at home, a total of 5 weeks off work.
- Based on an outbreak occurring every 10 years

Table 18 considers a range of cost impacts that may be imposed onto government as a result of a significant outbreak occurring every 10 years.

Table 18 Potential cost impacts of not implementing reforms in WA to prevent a Legionnaires' Disease outbreak

Impact	Comments	Cost
Cost to government		
Environmental Health investigation	<ul style="list-style-type: none"> 20 FTE Environmental Health Officers Average hourly rate is \$40 per hour, 8 hours per day 14 day period of investigation. This scenario is based on a similar outbreak in South Australia [21] 	(40 x 8 x 14) x 20 = \$89,600 employment costs
Microbiological investigation	<ul style="list-style-type: none"> 200 samples \$70 per sample based on rate charged by PathWest 	\$14,000 sampling costs
Epidemiological investigation	<ul style="list-style-type: none"> 2 FTE Average hourly rate is \$40 per hour, 8 hours per day 14 day period of investigation 	\$8,960 employment costs
Hospital and medical costs	<ul style="list-style-type: none"> Cost to treat each patient \$19,691 [2] Based on 100 patients 	100 x 19,691 = \$1,969,100 medical costs
Death	<ul style="list-style-type: none"> 5-10% of people die after being exposed to Legionnaires' = 10 deaths every 100 patients 1 death has been estimated to cost \$4.2 million per person in Australia [22] 	10 deaths x \$4.2 million = \$42,000,000
Loss of productivity	<ul style="list-style-type: none"> 2 weeks hospitalisation per patient on average 3 weeks recovery at home on average Total of 5 weeks away from work ABS data to derive an average GDP per employed person \$30,864 per person, for 90 people who survived 	90 x \$30,864 = \$2,777,760
Cost to business		
Public liability costs	<ul style="list-style-type: none"> 90 people who survived 10 deaths Based on average payout of \$31,000 per person as reported by the 2015 Public liability and professional indemnity insurance ACCC [23] 	\$31,000 x 100 = \$3,100,000
TOTAL (Based on an outbreak every 10 years)		\$49,959,420
Per annum costs		\$4,995,492

Indirect impacts of not implementing reforms

Other indirect impacts that have not been costed in this scenario include:

- Negative impacts to the reputation of the State Government who would be under significant public scrutiny for not having regulatory controls in place to manage the public health risks
- Cost impacts on tourism due to a reduction in tourists who do not feel safe travelling to WA following an outbreak
- Negative media attention
- Potential cost implications for businesses to cease operations, vacate a building and stop operating while the problem is rectified
- Additional costs to industry to disinfect nearby cooling towers that may potentially be implicated in an outbreak.

**The potential cost impacts of no reforms are estimated at
= \$4,995,492 per annum**

Note: This cost takes into consideration that 5-10% of people are likely to die after being exposed to Legionnaires' Disease. Therefore for every 100 patients it is expected that 10 deaths may occur. In Australia, the Victorian Commissioner for Better Regulation estimated that 1 death costs \$4.2 million per person in Australia [22].

6.2 Costs with regulatory controls [includes existing costs and potentially new costs]

To explore the cost implications of businesses and government implementing regulatory reforms to prevent or minimise outbreaks of Legionnaires' Disease in WA, a review of common costs associated with current or future regulatory controls was undertaken.

Most of these costs would already be incurred by responsible businesses to comply with the requirements of AS3666 Part 2 or 3, which is the current standard industry practice.

Regulatory costs that have also been included in this assessment include the cost for business to:

1. register per annum
2. develop a risk management plan
3. organise an annual audit of the risk management plan each year
4. comply with standard operational costs
5. comply with ongoing maintenance costs
6. pay for an annual inspection
7. complete record keeping and administration.

Costs are based on an estimated 3,192 facilities having a registerable cooling tower in WA.

Table 19 Potential cost impacts to business related to complying with regulatory requirements for Air-handling Regulations

Impact	Comments	Cost per annum	Cost based on ~ 3,192 industries
Registration	Administrative costs will be imposed on industry to comply with any registration requirements. However, these are minimal. Registration cost may be between \$40 to \$100 per cooling tower per year based on costs charged by SA and VIC. [24] [2]	\$100	\$319 200
Administration	Administration cost (labour time) of filling out paper work related to annual registration	\$60	\$191 520
Inspection cost	Based on an annual inspection of system using the cost charged by South Australia \$145.00 for the first system	\$145	\$462 840
Risk management plan	Likely to impose costs on industry to develop a risk management plan in accordance with current best practice requirements. The cost of developing a risk management plan varies depending on the type of facility and the number of cooling towers that may be located on each site. Based on cost modelling by the Victorian Government, industry estimates the cost of developing a risk management plan lies in the range \$500 - \$2500, while the average cost is believed to be in the vicinity of \$1000, reflecting the fact that the majority of cooling tower systems are relatively small in size. [2] This cost is based on a risk management plan being developed or rewritten every 5 years.	\$1000 / 5	\$3 192 000 / 5 = \$638,400
Audit costs	Annual audit/review of risk management plan lies in the range of \$150 to \$500, the average cost is estimated at \$250 [2]	\$250	\$798 000
Recordkeeping	<ul style="list-style-type: none"> ▪ Log book maintenance \$70 [2] 	\$70	\$223 400

Procedural / compliance	Maintenance costs including:		
	▪ Monthly service/inspection \$1065		
	▪ Cleaning and disinfection \$560		
	▪ Bacterial testing \$750 [2]	\$2445	\$7 804 440
	▪ Decontamination \$70		
	= \$2445 per cooling tower (Based on Victoria modelling) [2]		
TOTAL			\$10,437,800

**The potential annual cost impacts of regulatory controls are estimated at
= \$10,437,800 per annum**

Risk management options



7 Risk management options

The Better Regulation Unit (BRU) administers the Regulatory Impact Assessment (RIA) process in WA. The BRU assists State Government agencies in achieving best practice in accordance with RIA requirements. The RIA process is designed to improve the quality of regulation by ensuring that the decision maker is fully informed when approving new and amending regulatory instruments.

As part of the RIA process, the DOH has considered three policy options for WA to manage the public health risks of Legionnaires' Disease. Options help identify the most effective solution: a range of alternative ways of solving the problem will allow for all practicable options to be considered and assessed. This will enable the most effective option to be identified. All options considered must be practical, feasible and capable of achieving the stated objectives, which are to:

1. Ensure the correct operation and regular maintenance of air-handling systems installed in WA buildings
2. Ensure the correct operation and regular maintenance of water distribution systems in high risk buildings such as hospital's and aged care facilities
3. Ensure timely and effective control measures are initiated in the event of a Legionnaires' Disease outbreak in WA to minimise the risks to public health
4. Prevent outbreaks of Legionnaires' Disease and other airborne diseases from cooling towers and water distribution systems in WA.

Options considered include:

- **Option A: Enable the industry to self-regulate by providing an industry guideline.**
- **Option B: Retain the status quo by making equivalent regulations as far as practicable**
- **Option C: Develop new regulations to manage public health risks, with building requirements addressed by the Building Code of Australia**
- **Option D: Manage this public health risk under Occupational Safety and Health legislation**

These options are discussed in detail below with consideration given to the advantages and disadvantages of each option.

7.1 Option A: Enable industry to self-regulate. Provide an industry guideline.

Deregulate the air handling and water systems industry and enable the industry to self-regulate. Provide an industry guideline or Code of Practice.

Industry self-regulation is the controlling of a process or activity by the people or organisations that are involved in it rather than by an outside organisation such as government [25].

Industry can initiate a host of self-regulatory schemes for a variety of reasons. For commercial reasons, industry may develop a scheme to win consumer confidence and boost sales. Industry may also promote self-regulation as an alternative to government regulation.

In principle, self-regulation offers greater speed, flexibility, sensitivity to market circumstances and efficiency than government regulation. But according to its critics, self-regulatory standards

are usually weak, enforcement is ineffective and lacking in accountability and punishment is secretive and mild.

Existing research into 'pure' industry self-regulation, which does not include any direct involvement of government, suggests a number of lessons with regard to the limitations of this approach. In practice, pure self-regulation often fails to fulfil its theoretical promise and commonly serves the industry rather than the public interest [26].

Evidence consistently shows that self-regulation fails to deliver benefits for public health. Key findings from academic evaluations include:

1. Voluntary commitments are generally not designed based on the best evidence of what is needed to promote health.
2. The lack of enforcement mechanisms and sanctions means that participants can break their commitments without consequence.
3. Due to their voluntary nature, not all relevant persons will participate, weakening the potential impact of self-regulation.
4. Voluntary commitments usually involve activities that would have taken place anyway, providing limited, if any, added value.
5. Voluntary commitments are usually vague and permissive and their implementation is difficult to monitor and compare, also because reporting tends to be varied [26].

Although the DOH considers self-regulation to be an appropriate measure in certain circumstances, particularly for public health risk activities on the lower spectrum of risk (e.g. those considered to be a moderate, low or very low risk to the community), the DOH has a responsibility to the people of WA where risks such as death may occur through mismanagement. A Legionnaires' Disease outbreak in WA, particularly an outbreak that has a fatality rate of between 5-10%, would create serious public outcry and calls for government intervention. Such public outcry was evident in Australian cases such as the April 2000 outbreak at the Melbourne aquarium, with 125 confirmed cases and 4 deaths. This outbreak resulted in a significant overhaul of the regulation of air-handling systems by the Victorian Department of Health.

The New York government received significant criticism for not having regulations to monitor industry and respond effectively to Legionnaires' Disease outbreaks.

Although the total payout for the public liability claim against multiple parties involved in the Melbourne aquarium outbreak is not known, the potential financial implications for industry not complying with generally accepted practices far outweigh the cost of any regulatory control measures that may be imposed.

The above example demonstrates that, even where most of the industry is performing to a high standard, a major public health risk may arise from a single non-compliance at a high exposure risk facility.

The cost implications to the WA Government for any environmental health, epidemiological or microbiological investigations, as well as the treatment of persons who may contract the disease, would be considerable. A study in the UK estimated the costs for government following an outbreak of just 14 cases of Legionnaires' Disease to be in the order of approximately \$1,458,302. This is a significant cost to the government which can be avoided or minimised through the implementation of regulatory controls that ensure routine operation and maintenance programs are adhered to by industry [13].

The total potential cost of no regulatory controls in WA (summarised in section 6.1) includes the total cost of 10 people dying of Legionnaires' Disease and 90 additional cases, which is

estimated to be in the order of \$49,954,940 following an outbreak scenario of 100 cases. This is cost equates to approximately **\$4,995,492** per annum.

Each potential death has been estimated to cost \$4.2 million per person in Australia [22].

Worldwide Legionnaires' Disease outbreaks, which have resulted in multiple deaths, have proven that industry does not always voluntarily adhere to generally accepted requirements. The outbreak in 2015 in New York is an example where no regulations were in place, which lead to a significant outbreak and 16 deaths. The New York government received significant criticism for not having regulations to monitor and respond to such outbreaks [11].

The public health risk assessment undertaken in section 4.11 indicates that the risk levels related to a single outbreak event are catastrophic. This is not considered to be an acceptable risk to the community. The DOH has an obligation in accordance with the objects and principles of the Public Health Act to be involved in the management of public health risks to the community and where necessary, to provide regulatory requirements to prevent disease.

7.1.1 Impact analysis of Option A

A review was undertaken to determine the advantages and disadvantages of option A. These are specified below.

<p>What are the ADVANTAGES of choosing this option?</p>	<ul style="list-style-type: none"> ▪ There is no regulatory burden or red tape for the public or industry. ▪ All persons are required to comply with the general public health duty under Part 3 of the Public Health Act, which provides some assurance that a person must take reasonable and practicable steps to prevent or minimise any harm to public health. ▪ There would be no administrative or enforcement responsibilities or costs for local or state government agencies associated with competency training, monitoring, auditing or inspecting. ▪ There are no mandatory regulatory costs imposed onto industry, government or the public. ▪ Industry may take whatever voluntary measures they deem necessary to minimise risk of legionella growth, without government oversight.
<p>What are the DISADVANTAGES of choosing this option?</p>	<ul style="list-style-type: none"> ▪ This approach does not align with the objects and principles of the Public Health Act, which imposes a responsibility on the Chief Health Officer to protect the community from possible disease. ▪ There would be no regulatory controls to monitor or audit compliance by industry or powers to State and Local Government to respond to public health risks from Legionnaires' Disease. This may contribute to increased disease activity, deaths and increased costs associated with: <ol style="list-style-type: none"> 1. environmental health investigations 2. epidemiological investigations 3. microbiological investigations and 4. treatment of people affected by the disease 5. premature death. ▪ There would be inconsistent compliance with generally accepted standards by businesses, which may result in avoidable Legionnaires' Disease outbreaks. ▪ Businesses may be exposed to greater public liability claims if they cannot provide the evidence that they have complied with generally accepted practices and appropriately audited their risk liability. ▪ There would be a lack of accountability and penalties to deter industry from not complying with generally accepted standards.

- There would be public uncertainty of the State Government's ability to effectively respond to a Legionnaires' Disease outbreak in WA due to lack of controls and lack of knowledge of the location of where cooling towers and warm water systems are located.
- Government would not be in the most effective position to respond to an outbreak, which may result in delays in treating the source of infection and potentially result in more people being exposed to the disease.
- This approach is inconsistent with other Australian and international laws for managing risks of air-handling and warm water systems which have some level of regulation.
- It is likely that there would be an increase in disease activity or major event which may increase the financial burden on local and State government to investigate and manage the disease control.
- There would be no ability to issue infringement notices as a deterrent for non-compliance with accepted operating and regular maintenance practices.
- Not regulating would provide no formal recognition of Legionnaires' Disease as a serious public health risk or recognise the social cost of deaths resulting from an outbreak. This would make WA susceptible to criticism and distrust.
- It may be more difficult to inspect and investigate any premises for compliance related to with proper operation and maintenance of systems and manage public complaints regarding observed non-conformances. There would be inconsistent enforcement as compliance with generally accepted practices would rely on general provisions without specific regulatory requirements. This would result in uncertainty for industry and local government authorised officers on the standard of practice required to control public health risks.
- Failure to comply with the general public health duty does not of itself constitute an offence though it may still provide grounds for other action under the Public Health Act to be taken and could result in prosecution.
- This approach is a missed opportunity to better protect the people of WA from disease.

7.2 Option B: Retain the status quo by making equivalent regulations

Retain the status quo, that is, replace the current regulations with equivalent regulations as far as practicable.

Transitioning the existing Air-handling Regulations under the Public Health Act framework is not considered to be an effective option due to a number of burdensome and outdated requirements in the current regulations. The DOH conducted a survey of WA local governments in July 2017 to determine the level of enforcement of the Air-handling Regulations by local government. These survey results, summarised in section 5.1, indicate that the Air-handling Regulations are not being effectively enforced across WA, with most local government respondents not registering or keeping an active list of cooling towers and warm water systems within their jurisdiction.

7.2.1 Impact analysis of Option B

A review was undertaken to determine the advantages and disadvantages of Option B. These are specified below.

<p>What are the ADVANTAGES of choosing this option?</p>	<ul style="list-style-type: none"> ▪ No requirement for any local or state government agency to do anything differently. ▪ There are no enforcement or surveillance costs for industry.
<p>What are the DISADVANTAGES of choosing this option?</p>	<ul style="list-style-type: none"> ▪ Current regulatory controls are limited, including: <ul style="list-style-type: none"> ○ There is no requirement for enforcement agencies or industry to audit and/or inspect air-handling and water systems for on-going compliance ○ No requirement for local government to keep an up-to-date register of cooling tower locations ○ Burdensome assessment and building approvals for local government, and lack of compliance by industry with approvals process ○ No ability to issue infringement notices ○ No ability to charge fees for registration ○ No requirement for industry to notify an enforcement agency of elevated legionella or heterotrophic plate counts ○ No inspection or auditing requirements ○ No risk based / management approach ○ Adoption of superseded Australian Standards ○ Lack of penalties for non-compliance with Australian Standards ○ Lack of penalties for causing a Legionnaires' Disease outbreak ○ Lack of provisions to enable mandatory testing. ▪ Current regulatory system has not been consistently enforced across WA. Places unnecessary administrative burden onto local government enforcement agencies to approve systems. ▪ There is an overlap between the Air-handling Regulations and the <i>Building Regulations 2017</i> related to the installation requirements of an air-handling and warm water system. This can lead to confusion by industry and local government on the correct legislation to comply with.

7.3 Option C: Develop new regulations to manage public health risks, with building requirements addressed by Building Code of Australia

The new regulations will manage public health risks and ensure building requirements are addressed by the Building Code of Australia

Although the current Air-handling Regulations have not been effectively implemented, and WA has yet to experience a significant outbreak of Legionnaires' Disease, this does not mean that the WA Government should be complacent in the control measures that are necessary to prevent an outbreak in the future. Most Australian jurisdictions have regulatory controls in place to manage the public health risks of cooling towers and warm water systems, with laws further tightened following outbreaks in South Australia, Queensland, Victoria and New South Wales.

There is a strong case for setting minimum acceptable standards by means of legislation due to the high risks of a Legionnaires' Disease outbreak. An outbreak in WA, particularly in the Perth city would be extremely detrimental and costly to tourism as well as to the general public and the workforce. The WA population continues to grow and the plumbing infrastructure will continue to age, which means some control measures for ongoing operation and maintenance of systems are necessary.

There is also a strong need to reduce unnecessary regulations by reducing duplication, administrative burdens and unnecessary enforcement responsibilities.

The Victorian Regulatory Impact Statement for the [Public Health and Wellbeing Act 2008](#) and the [Public Health and Wellbeing Regulations 2009](#), [2] identified a number of positive trends of implementation regulations to manage cooling towers following the 2000 Melbourne aquarium outbreak. This included a clear declining trend in the number of:

- Legionnaires' Disease cases reported from 2001 to 2008 (Figure 13)
- cooling towers testing positive for legionella (Figure 14).

This strongly suggests that the regulatory requirements introduced in 2001 in Victoria in relation to cooling tower systems have constituted the largest single factor explaining the observed decline in the number of cases of Legionnaires' Disease over the ensuing period [2].

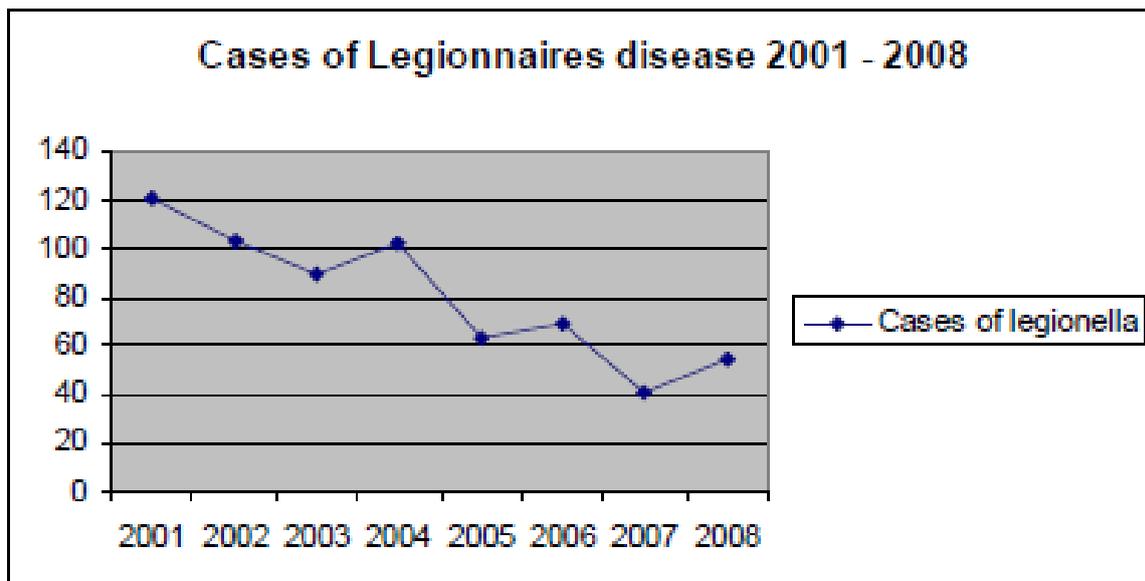


Figure 13 Cases of Legionnaires' Disease reported 2001 - 2008 in Victoria after new cooling tower legislation implemented, chart extracted from the Victoria Department of Health. Regulatory Impact Statement Public Health and Wellbeing Regulations. 2009;[2]

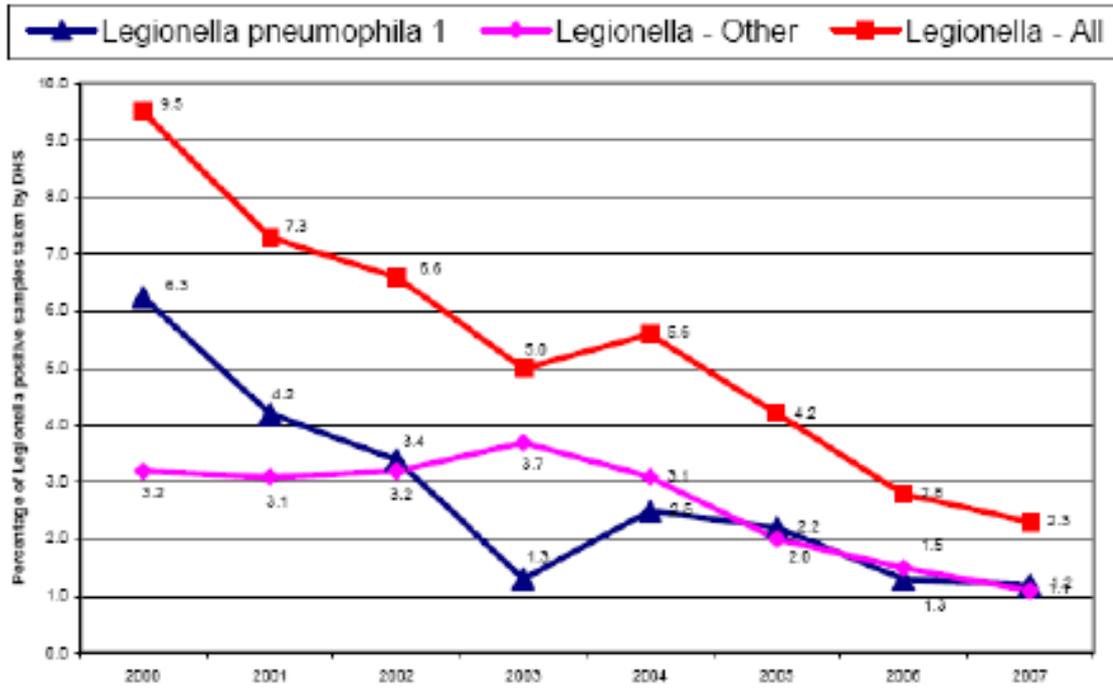


Figure 14 Proportion of cooling tower samples testing positive for Legionella in Victoria following implementation of new cooling tower legislation, chart extracted from the Victoria Department of Health. Regulatory Impact Statement Public Health and Wellbeing Regulations. 2009[2]

The lack of enforcement of the Air-handling Regulations in WA may be one, of many contributing factors, for the reason for the steady increase in Legionnaires’ Disease cases reported in WA over the past 10 years, outlined in Figure 15.

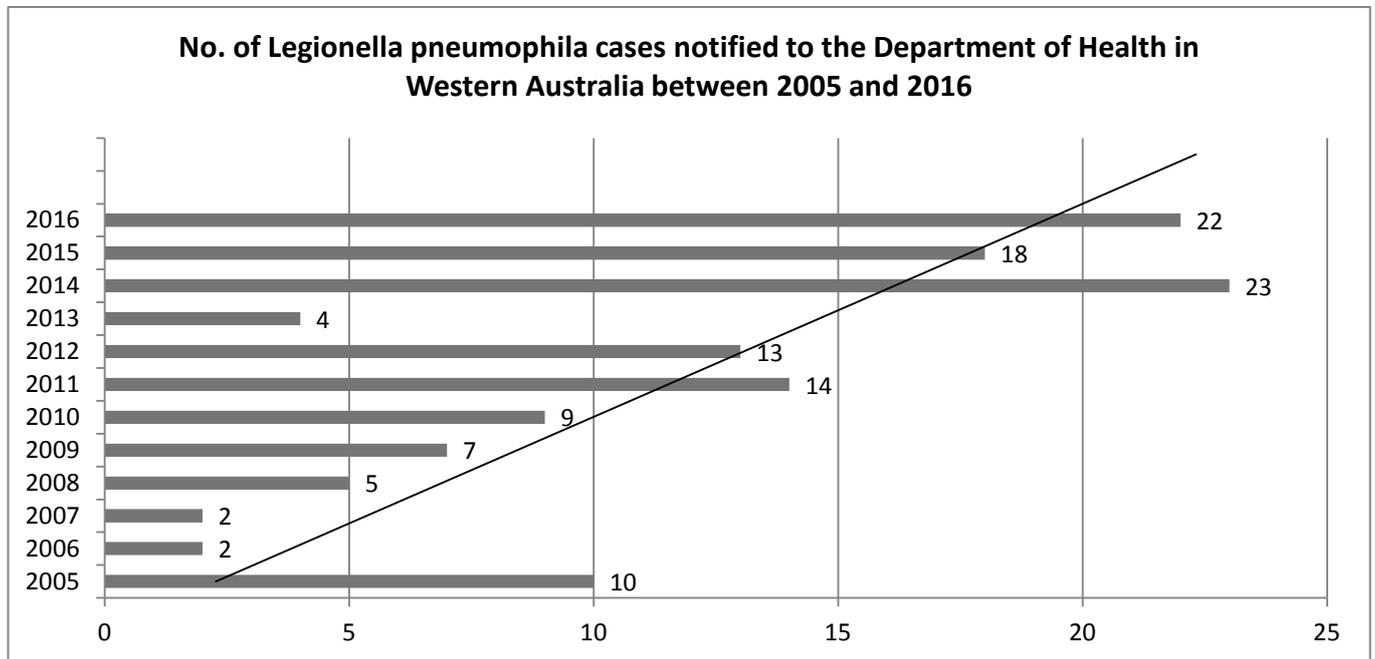


Figure 15 Number of cases of Legionella pneumophila notified to the Department of Health in Western Australia between 2005 to 2016

The purpose of any public health legislation for cooling towers and water distribution systems would be to:

- Continue to ensure systems are operated in accordance with the current AS3666 parts 2 and 3

- Provide assurance that owners are maintaining and operating systems according to specified requirements (e.g similar requirements of the Australian Standards)
- Establish a robust process for local government and the CHO to be able to respond in an outbreak. Any suspected system in the vicinity of an outbreak can, upon the provision of a notice, be:
 - sampled
 - shut down and
 - disinfected or decontaminated
- Enable the ability to inspect any system for operation and maintenance
- Provide for the ability to prosecute or issue an infringement for non-compliance
- Establish a requirement for the development of risk management plans and auditing requirements for cooling towers and water distribution systems in vulnerable buildings.
- Ensure high risk facilities such as hospitals and aged care buildings regularly maintain water distribution systems with the building.

7.3.1 Impact analysis

A review was undertaken to determine the advantages and disadvantages of Option C. These are specified below.

<p>What are the ADVANTAGES of choosing this option?</p>	<ul style="list-style-type: none"> ▪ Ensures the public are better protected from the risks of Legionnaires' Disease. ▪ Enables auditing and compliance testing of systems, allowing enforcement agencies to readily assess compliance with generally accepted practices when required. ▪ Enables government to investigate and respond efficiently and effectively in the event of a Legionnaires' outbreak to the general public. ▪ Enables local government to recoup costs associated with any registration and inspection requirements. ▪ Ensures accountability and record keeping by business to comply with generally accepted practices for minimising Legionnaires' risks to the community. ▪ Places the responsibility of auditing onto industry. ▪ Supports workforce opportunities for compliance testing, auditing and monitoring. ▪ This approach aligns with the objects and principles of the Public Health Act, which provides a responsibility on the Chief Health Officer to protect the community from disease. ▪ There would be consistent minimum compliance with standards by businesses, which will aim to prevent Legionnaires' Disease outbreaks. ▪ Businesses can minimise any public liability claims by showing that they have complied with generally accepted practices and appropriately audited their risk liability. ▪ Provides for immediate financial penalties to deter industry not complying with generally accepted standards. ▪ There would be increased confidence from the public that the State Government can effectively respond to a Legionnaires' Disease outbreak in WA due to effective controls and knowledge of the location of where cooling towers and warm water systems are located. ▪ Government would be in the most effective position to respond to an outbreak quickly, including promptly identifying the source of infection and preventing the spread of bacteria - potentially resulting in fewer people being exposed to the disease. ▪ This approach is consistent with other Australian and international laws for
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	<p>managing risks of air-handling and warm water systems. The matter is generally regulated in some way.</p> <ul style="list-style-type: none"> ▪ It is likely that there would be a decrease in disease activity. ▪ Regulating would provide a formal recognition of the social cost of an outbreak and that Legionnaires' Disease is a serious public health risk. ▪ There would be consistent enforcement by local government authorised officers.
<p>What are the DISADVANTAGES of choosing this option?</p>	<ul style="list-style-type: none"> ▪ Will reduce the administrative and enforcement responsibilities required by current legislation. It is anticipated that only 30 out of the 139 local governments in WA may have a significant impact on enforcement responsibilities under any future regulations with the proposed enforcement activities more feasible and likely to be implemented than the current requirements. ▪ Administrative costs will be imposed on industry to comply with any registration requirements. However, these will be minimal compared to the overall cost of proper installation, operation and maintenance of systems. Registration costs may be between \$40 to \$100 per cooling tower per year based on costs charged by SA and VIC. [24] [2] ▪ Likely to impose costs onto industry to develop a formal risk management plan in accordance with generally accepted requirements. The cost of developing a risk management plan varies depending on the type of facility and the number of cooling towers that may be located on each site. Therefore, guidance material can be referenced or developed to assist organisations in developing risk management plans that are appropriate and proportional to the size, distribution and complexity of the air handling and water systems used by a facility. Based on cost modelling by the Victorian Government, industry estimates the cost of developing a risk management plan lies in the range of \$500 - \$2500, while the average cost is believed to be in the vicinity of \$1000, reflecting the fact that the majority of buildings have single cooling tower systems that are relatively small in size. [2] ▪ Potentially imposes additional costs to industry to comply with current generally accepted requirements, for those industries that are currently not complying.

7.4 Option D – Manage this public health risk under Occupational Safety and Health legislation

There may be an opportunity to regulate this public health risk of legionella under the [Occupational Safety and Health Act 1984](#) and [Code of Practice - Prevention and control of Legionnaires' Disease 2010](#). This legislation is administered by the Department of Mines, Industry Regulation and Safety.

The code provides general guidance for employers, people in control of workplaces, designers, manufacturers, suppliers and workers on the identification and control of safety and health hazards and risks associated with Legionnaires' Disease; and information on the key requirements in the OSH and MSI legislation with respect to Legionnaires' Disease.

However, work health and safety laws are designed to protect the health and safety of workers and others who might be at risk from the work. Although the proper management of air-handling and water system within a building is paramount to the health and safety of the workforce, outbreaks generally occur outside of a building where the public are most susceptible.

Restricting the management of this public health risk under OSH legislation may impede a public health response that is reliant upon legislation not designed to protect the health of the wider community.

Presently, there is no registration, auditing, monitoring or surveillance program of cooling tower systems administered by the Department of Mines, Industry Regulation and Safety.

There is the capacity for cooling tower controls to work in unison between OSH and public health legislation.

7.4.1 Impact analysis

A review was undertaken to determine the advantages and disadvantages of Option D. These are specified below.

<p>What are the ADVANTAGES of choosing this option?</p>	<ul style="list-style-type: none"> ▪ Local government enforcement agencies would no longer have any compliance and enforcement responsibilities for air handling systems. ▪ Industry would only need to comply with OSH requirements.
<p>What are the DISADVANTAGES of choosing this option?</p>	<ul style="list-style-type: none"> ▪ This approach is not consistent with other Australian and international laws for managing risks of air-handling and warm water systems by health authorities. ▪ May impede health authorities ability to investigate and respond efficiently and effectively in the event of a Legionnaires' outbreak impacting the community. ▪ Reliant upon another government agency to protect the wider health of the community which is outside of their responsibility. ▪ Limits the ability for health authorities to maintain a list of cooling tower locations, and ensure surveillance and compliance programs are in place. ▪ Likely to increase workforce requirements for Department of Mines, Industry Regulation and Safety who may not have the capacity.

7.5 Questions: Preferred option for WA

Based on the advantages and disadvantages that have been discussed in the four options for managing the public health risks of air-handling and warm water systems, the DOH is seeking input from:

- local government representatives
- industry members
- association groups
- government sector
- members of the public

on the options considered to be the most feasible, practical and effective for achieving the desired public health objectives.

The Department of Health's preferred option is option C, the development of new regulations to manage this public health risk under the *Public Health Act 2016*. However, stakeholder input is critical in helping to identify the most appropriate management response or identify new options not considered as part of this proposal, and to ensure the impacts on consumers, business and government have been effectively considered.

A number of questions are outlined below and answers can be submitted on the WA Health online consultation hub at: <https://consultation.health.wa.gov.au>

Question 1	Please indicate your preferred option for managing risks associated with air-handling and water systems.
	<ol style="list-style-type: none"> 1. Option A: Enable the industry to self-regulate. Provide an industry guideline or Code of Practice. 2. Option B: Retain the status quo, that is, replace the current regulations with equivalent regulations as far as practicable. 3. Option C: Develop new regulations to manage public health risks, with building requirements to be addressed by the Building Code of Australia. 4. Option D: Manage this public health risk under Occupational Safety and Health legislation 5. None of these options.
Question 2	Based on your answer to the previous question, please explain why this is your preferred option.
Question 3	<p>Do you have any suggestions for alternative options that have not been considered in the discussion paper?</p> <p>Please explain your ideas by providing examples of complaints, case studies, data or other useful evidence.</p>
Question 4	Do you have any other comments about controlling the public health risks related to air-handling and warm water systems in WA? For example, do you have any examples of complaints, health issues or other possible concerns that may need to be addressed into the future that may assist with this review?
Question 5	Do you have any comments or advice about costs and benefits of the alternative options?

8 Glossary

Air-handling Regulations	<i>Health (Air-handling and Warm Water Systems) Regulations 1994</i>
Cooling tower	A cooling tower is a device for lowering the temperature of water by evaporative cooling in which atmospheric air is in contact with falling water, thereby exchanging heat. Many buildings such as hotels, hospitals, shopping centres, office towers and universities may have one or multiple cooling towers installed on each building.
Warm water system	Warm water systems distribute water to outlets used for personal hygiene purposes such as showers, basins and baths, at a reduced temperature (in the vicinity of 40 degrees), to minimise the risk of scalding. They should not be confused with the 'heated water system' typically installed in all, or most, buildings, including circulatory heated water systems that are designed to distribute heated water at higher temperatures, although there are numerous similarities. Many hospitals have warm water systems to minimise scalding to patients
DOH	Department of Health
DOHMH	New York Department of Health and Mental Hygiene (DOHMH)
<i>Legionella pneumophila</i> <i>L. pneumophila</i>	Refers to the bacteria that cause Legionnaires' Disease.
NYSDOH	New York State Department of Health

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10 Appendices

10.1 Appendix 1 – Regulatory mechanisms under the Public Health Act

General public health duty

The general public health duty requires that a person must take all reasonable and practicable steps to prevent or minimise any harm to public health that might foreseeably result from anything done or omitted to be done by the person.

Where the general duty is to be applied, there must be some clear *harm* (or foreseeable harm) to public health. In cases where matters are a nuisance or amenity problem but no health effect can be proven, such as unsightly yards, neighbourhood disputes and inconveniences, the general duty will not apply.

Non-compliance with the general duty is not an offence in itself but may lead to action such as the issuing of improvement notices and enforcement orders under Part 14 of the Public Health Act. Guidelines and regulations may be used to clarify the application of the general public health duty and provide information about the measures that may constitute compliance or non-compliance.

A person will not be taken to be in breach of the general duty if acting in a manner that accords with generally acceptable practices or in circumstances prescribed by regulations.

Binding the Crown

As the *Health (Miscellaneous Provisions) Act 1911* does not specify binding the Crown, many provisions are not applicable or cannot be enforced on Crown land.

The Public Health Act does bind the Crown, which requires the State agencies for Crown vested land to comply with the legislation.

Infringement notices

The Act allows for the making of regulations that prescribe offences for which an infringement notice may be issued. An infringement notice is a written notice that a person has allegedly committed a specific offence which requires the payment of a fine or the election to have the matter heard in court. Payment of the fine does not lead to the recording of a conviction.

In the development of the new regulations, the DOH must give consideration to the use of infringement notices and which offences will be prescribed as those for which an infringement notice can be issued.

An infringement notice may generally be used when:

- there is prima facie evidence of a legislative breach;
- a legislative breach has occurred which is of minor impact and which can be remedied easily;
- a breach is the result of failure to comply with normal operating procedures or requirements which are ordinarily in place and if used would have prevented that breach;
- no further prosecution of that matter is necessary; and
- it is likely to be an adequate deterrent.

It would be inappropriate to use an infringement notice when:

- large-scale harm to public health has occurred;

- the breach has had a significant impact upon other persons or property;
- the breach is continuing, and it is not within the alleged offender's ability to remedy quickly.

Infringement notices can only be issued where prescribed by a regulation or local law.

Improvement notices and Enforcement orders

An improvement notice is an order that either requires or prohibits a person from taking specified action. There is often a timeframe in which the offender has to comply with the improvement notice. Once the timeframe has elapsed, the authorised officer can:

- Extend the time in which the offender has to comply.
- Issue a notice of compliance if the officer is satisfied, after carrying out an appropriate assessment, that the improvement notice has been complied with.
- Issue a notice that sets out the reasons why the officer is not satisfied that the improvement notice has been complied with.

An enforcement order is an order that either requires or prohibits a person from taking specified action. A prohibition with respect to specified action may be limited, absolute or conditional.

An enforcement order can be issued by an enforcement agency if it reasonably believes that an improvement notice has not been complied with, or if the issue of the order is necessary to prevent or mitigate a serious public health risk. An enforcement agency may issue an enforcement order in respect of non-compliance with an improvement notice irrespective of whether the improvement notice was issued by a person who was an officer of that or another agency.

Enforcement agencies can use improvement notices or enforcement orders under the Public Health Act in relation to aspects of regulations should they choose to do so.

Prosecution

Prosecution plays an important role in deterring non-compliance with legislation. In accordance with Part 18, section 280 of the Public Health Act, an enforcement agency may commence proceedings for an offence under the Act or its regulations. As prosecution is separate from action under Part 14, it can be commenced irrespective of whether an improvement notice or enforcement order has been issued. The relevant circumstances may include, for example, where the breach relates to a serious compromise of health standards and is of such a nature as to amount to a serious threat to public health and safety.

Registration and licensing

Under the Public Health Act, regulations can declare what is a public health risk activity and if it is required to be registered, licensed or both. The regulations will prescribe who the appropriate enforcement agency is for each registrable and/or licensable activity. This may be the local government, the Chief Health Officer or both. The regulations may also prescribe an annual or other fee in relation to the registration or licensing of a registrable or licensable activity.

Regulations may prescribe offences in relation to an activity and provide modified penalties for which an infringement notice may be issued.

10.2 Appendix 2 - Public health risk assessment

A number of risk assessment tools need to be used to determine the risk level for each identified public health risk. These tools include a health consequences table (Table 4), risk likelihood table (Table 5) and risk qualitative matrix (Table 6).

These risk assessment tools are from AS/NZS ISO 31000:2009 Risk Management – Principles and guidelines [27] and the Health Risk Assessment (Scoping) Guidelines [28].

The DOH has five Public Health Risk levels (shown Table 3), each requiring a varying degree of DOH involvement in their management.

Table 3 Definition of risk levels

Risk Level	DOH management requirements
Very Low Public Health Risk	No further assessment required
Low Public Health Risk	Some mitigation/management may be required – no detailed assessment of health hazards required but addressed with routine controls
Moderate/Medium Public Health Risk	Substantial mitigation/management required – assessment required of health hazards
High Public Health Risk	Not an acceptable risk. The DOH needs to be involved in the management of high public health risks. Major mitigation/management (including offsets) may be required – assessment required of health hazards
Extreme Public Health Risk	Potentially unacceptable: modification of proposal required

Table 4 Health consequences table adapted from the 2011 Health Risk Assessment (Scoping) Guidelines, DOH WA

Category	Acute Health Consequences (per hazard or outbreak)	Chronic Health Consequences (per project lifecycle)
1 Catastrophic	<ul style="list-style-type: none"> >1 fatality OR >5 permanent disabilities OR Non-permanent injuries requiring hospitalisation for 5 – 10 % of populations at risk OR Acute health effect requiring hospitalisation for 5 – 10 % of populations at risk 	Chronic health effect requiring medical treatment for 10 – 15 % of population at risk
2 Massive	<ul style="list-style-type: none"> 1 fatality OR 2 – 5 permanent disabilities OR Non-permanent injuries requiring hospitalisation for 2 - 5 % of populations at risk OR Acute health effect requiring hospitalisation for 2 – 5 % of populations at risk 	Chronic health effect requiring medical treatment for 5 - 10 % of population at risk
3 Major	<ul style="list-style-type: none"> No fatality AND 1 permanent disability OR Non-permanent injuries requiring hospitalisation for 1 – 2 % of populations at risk OR Acute health effect requiring hospitalisation for 1 - 2 % of populations at risk OR Evacuation is necessary 	Chronic health effect requiring medical treatment for 2 - 5 % of population at risk
4 Moderate/ Significant	<ul style="list-style-type: none"> No fatality AND No permanent disability AND Non-permanent injuries requiring hospitalisation for 1 – 2 % of populations at risk OR Acute health effect requiring hospitalisation for 1 – 2 % of populations at risk AND No evacuation 	Chronic health effect requiring medical treatment for 1 - 2 % of population at risk

Category	Acute Health Consequences (per hazard or outbreak)	Chronic Health Consequences (per project lifecycle)
5 Minor	<ul style="list-style-type: none"> No fatality AND No permanent disability AND Non-permanent injuries requiring hospitalisation for 1 – 5 persons OR No Acute health effect requiring hospitalisation AND No evacuation 	Chronic health effect requiring medical treatment for 0 - 1 % of population at risk
6 Negligible/ Slight	<ul style="list-style-type: none"> No fatality AND No permanent disability AND No Non-permanent injuries requiring hospitalisation AND No Acute health effect requiring hospitalisation AND No evacuation 	No chronic health effect requiring medical treatment

Table 5 Risk likelihood table adopted from the 2011 Health Risk Assessment (Scoping) Guidelines, DOH WA

Likelihood	Expected or Actual Frequency	% Chance of chronic health effect during life of project
Almost Certain	More than once a year	Over 90%
Likely	Once in 1 to 3 years	61 – 90%
Possible/ Occasionally	Once in 3 – 5 years	31 – 60%
Unlikely	Once in 5 – 10 years	6 – 30%
Rare/Remote	Once in more than 10 years	Up to 5%

Table 6 Risk matrix (qualitative)

Likelihood	Consequences					
	Slight/ Negligible	Minor	Moderate	Major	Massive	Catastrophic
Almost certain	Low	Medium	High	Extreme	Extreme	Extreme
Likely	Low	Low	Medium	High	Extreme	Extreme
Possible	Very Low	Low	Low	Medium	High	Extreme
Unlikely	Very Low	Very Low	Low	Low	Medium	High
Rare/ Remote	Very Low	Very Low	Very Low	Low	Low	Medium

10.3 Appendix 3 – Lessons learnt

Table 14 Lessons learnt for legislative controls from other Australian States

State/ Territory	Regulation / Code of Practice/ Guidelines
Vic	<p>The DOH emailed the Victorian Department of Health and Human Services (DHHS) to identify any lessons that the WA DOH could learn since the inception of their cooling tower legislation. A summary of advice provided by the DHHS is outlined below:</p> <ul style="list-style-type: none"> ▪ DHHS employ 3 FTE to coordinate legionella risks across the State. The advantages are consistency in compliance checks, a centralised register/ payment system and easier to coordinate case investigations across different LGAs. ▪ The regulations are being reviewed in 2019. There will be support to continue the cooling tower regulations in their present form. However, there will be some discussion about water delivery systems in hospitals regulations. ▪ Currently, hospitals are not required to register because DHHS are able to access lists of health and aged care facilities and can communicate with them (saving them the burden of having to register). ▪ The register enables accurate mapping of cooling towers, which enables automatic map exposure points for every case then identifying every cooling tower within a specified distance the person would have been near. The register is considered essential. ▪ DHHS currently have 3,215 cooling tower systems registered on 1,907 sites across Victoria. DHHS are funded to undertake 1,000 inspections each year. DHHS focus their inspections on sites that are associated with cases of Legionnaires' Disease, that have failed their annual audit, have not had an annual audit or have failed to register / renew their registration. ▪ One issue DHHS have relates to who is responsible for registering the towers. At the moment it is the land owner, the advantage of which is that it is very clear who owns the land. However, often the land owner will not know that there is a cooling tower on their property which means DHHS need to take additional steps if DHHS want to prosecute. In New York, when you register a cooling tower you must notify the land owner. DHHS might make this change to their legislation. ▪ There is some reluctance to pay for the annual audit, although there are auditors specialising in auditing small businesses that don't charge much. The audit process doesn't require a visit to site and can be a desk top audit which can keep costs down.
NSW	<p>In 2017, NSW initiated a review of the <i>Public Health Regulation 2012</i> and released the:</p> <ul style="list-style-type: none"> ▪ Proposed changes to the regulation of water-cooling systems to prevent Legionnaires' Disease in NSW: Consultation Discussion Paper ▪ Proposed changes to the regulation of water-cooling systems to prevent Legionnaires' Disease in NSW <p>Key findings of the consultation:</p> <p>1. Amend the <i>Public Health Regulation 2012</i> to require occupiers of premises containing water-cooling systems to ensure:</p> <ol style="list-style-type: none"> 1.1. A risk assessment is performed in accordance with Australian Standard 3666 Part 3, and documented as a risk management plan (RMP), by a competent person, every five years. 1.2. Annual auditing of RMPs is performed by an independent auditor, and audit certificates are lodged with local government. 1.3. Monthly inspection, chemical analysis, and laboratory testing for Legionella and heterotrophic colony count (HCC) are performed by a duly qualified person, and local government is notified of critically high Legionella count >1,000 cfu/mL or HCC >5,000,000 cfu/mL. 1.4. Unique identification numbers are attached to individual cooling towers, to assist with outbreak investigation activities. 1.5. Requirements for remedial action in response to high levels of Legionella and HCC are clearly set out in the Regulation. <p>2. Support the above regulatory amendments by:</p> <ol style="list-style-type: none"> 2.1. Developing guidance on the roles and responsibilities of occupiers, risk assessors, auditors, authorised officers, industry, local government and NSW Health.

- 2.2. Creating procedures and protocols for responding to the new regulatory requirements, for example, the local government response to a notification of critically high Legionella levels in a water-cooling system.
- 2.3. Working to build capacity in the relevant workforces, for example, by outlining an education and training curriculum for stakeholders involved in managing water-cooling systems in NSW.
- 2.4. Ensuring that any changes to the Regulation have a sufficient lead in time for stakeholders.

NSW – survey of compliance

From September 2010 to May 2011, NSW Area Health Services’ environmental health officers and environmental health officers from local councils visited 294 randomly selected water cooling systems across the state. The purpose was to assess legislative compliance of water cooling systems with the fundamental prescribed installation, operational and maintenance requirements of the *Public Health (Microbial Control) Regulation 2000*. The survey was designed to assess whether compliance varied by regulatory approach. Water cooling systems were classified by the following regulatory approach adopted by councils: no inspection, requesting the certificate of effective process of disinfection, Council Environmental Health Officer (EHO) inspects a sample, contractor inspects all and Council EHO inspects all. Compliance was assessed by 16 main criteria in 5 different domains: installation, availability of manuals, maintenance, operation, and bacteriological assessment.

Key findings:

- Those water cooling systems that were not subject to any form of inspection by the local council had a significantly higher proportion of water cooling systems that were non-compliant in the following three domains: presence of manuals, maintenance and operation. There were no clear differences between the compliance activity chosen: requesting a certificate of inspection, Council EHO inspecting a sample, a contractor inspecting all and Council EHO inspecting all seemed approximately equally effective and better than no inspection.
- Overall 70% of water cooling systems did not comply with one or more of the assessment criteria, 54% did not comply with one to three of the criteria assessed and 17% failed on 4 or more of the assessment criteria.
- 16% of water cooling systems were assessed as not having safe and easy access. Drift eliminators were not fitted to 10% of water cooling systems.
- Around 6% of inspected premises did not keep adequate maintenance records, including monthly system inspection reports, water treatment system inspection records and six monthly cleaning reports.
- The internal surfaces of 16% of water cooling systems were assessed as mildly dirty or very dirty and 6% of the water cooling systems inspected had water in the cooling tower basins assessed as cloudy or murky.
- The processes to control microbial growth were not certified by a competent person in 9% of water cooling systems in the previous 12 months and 2% of premises did not have an operational process of disinfection.
- Nearly a third (31%) of water samples exceeded the limit of 100,000 cfu/mL for Total Plate Count. Total Legionella was detected at greater than 10 cfu/mL in 5% of water samples. [29]

SA

The DOH contacted SA Health to discuss any advice they could provide regarding their cooling tower regulations. These points are summarised below.

- Phased in requirement for drift eliminators and automatic biocide requirements to ensure industry has appropriate time to comply. Recommend manufacturer provides a compliance certificate stating that drift eliminators and biocide comply with Australian standards.
- Differentiate between part 2 and part 3. Industry can chose to comply with either Part 3 or 3 of AS3666. Part 2 is the most common standard that operators choose to comply with, designed for systems that can be shut down. Generally only the much larger systems (e.g. mine sites) will comply with Part 3 because they claim to not be able to shut the system down.
- Currently SA regulations apply to all warm water systems. However, this may change so the focus is only on hospitals and aged care facilities. When the regulations were first brought out there was a huge cost to government e.g. Education department, who had up-front costs to comply with the new requirements. Such locations may be considered low risk and not

	<p>necessary.</p> <ul style="list-style-type: none">▪ Public hospitals are managed by local government, who must pay a registration fee.▪ Every cooling tower must be inspected at least once every year or they can issue a notice to owner to get a competent person to do the inspection.▪ Definition regarding competent person not working and a lot of dishonest operators started undertaking inspections. Local government initially used the competent person requirement but have since taken back control and undertake the inspections themselves due to many inexperienced 'competent persons'.▪ Recommends not using a third party auditor process, to avoid inexperienced or dishonest operators. Otherwise a stringent auditor's process is required.▪ Approximately 350 cooling towers in SA, with majority in the metropolitan area.▪ SA only require annual sampling not monthly – monthly sampling is only required in Part 3. Part 2 does not require monthly sampling.▪ During a heat wave SA tend to have an outbreak each summer, may be associated with biocide dosing.▪ In general, if there is an outbreak within an area such as the CBD, the quickest response is to email all water service providers and get them to service or decontaminate systems.
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