

# Naegleria Response Protocol for drinking water supply systems



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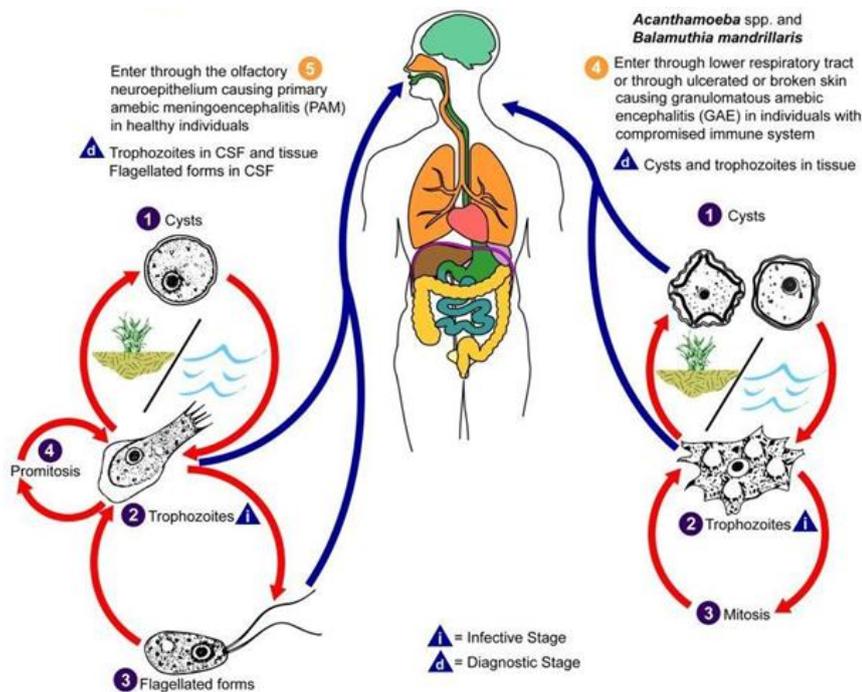
# 1. Background

*Naegleria* is a free-living amoeboflagellate in soil and aquatic habitats. *Naegleria* infection (amoebic meningitis, also known as primary amoebic meningoencephalitis) is acquired by exposure of the olfactory mucosa high in the nasal passages to water contaminated with *Naegleria fowleri* (*N. fowleri*), the pathogenic species, most commonly by diving or swimming in fresh water, or inadequately maintained or inadequately disinfected spas, tubs or swimming pools.

There have been four recorded cases of amoebic meningitis in Western Australia to 1985. There have been no further cases since this disease became a notifiable disease in WA in May 1985. More recently, there have been cases in other Australian jurisdictions as well as cases in the United States of America. The infection is fatal in virtually all cases, but can be prevented by adequate disinfection of water to which people may be exposed and through public education.<sup>4</sup>

This protocol has been developed by the Department of Health WA in consultation with drinking water providers in Western Australia and PathWest Laboratory Medicine WA to assist with the management of thermophilic amoebae and positively identified *Naegleria fowleri* from reticulated drinking water supplies in Western Australia. It also provided some useful background information and links in relation to aquatic facilities and nasal irrigation.

# 2. Mode of transmission



<sup>4</sup> More information about amoebic meningitis can be found at: [https://healthywa.wa.gov.au/Articles/A\\_E/Amoebic-meningitis](https://healthywa.wa.gov.au/Articles/A_E/Amoebic-meningitis)



### 3. Australian Drinking Water Guidelines

The *Australian Drinking Water Guidelines*, published by the National Health and Medical Research Council as “[Australian Drinking Water Guidelines 2011 - Version 3.5 Updated August 2018](#)”, provides an authoritative reference on what defines safe, good quality water, how it can be achieved and how it can be assured. The Guidelines state:

*“Two groups of free-living amoebae, Naegleria and Acanthamoeba, have been responsible for human infections in Australia. Infection is opportunistic and generally results from contact during recreational bathing, or domestic uses of water other than drinking. Public water supplies can contaminate swimming pools. The occurrence of these organisms is unrelated to faecal contamination and their ecology in aquatic environments is more complex than that of enteric protozoa.”*

*“Cerebral infection by Naegleria fowleri is strictly waterborne and although rare is usually fatal. Since these amoebae are able to colonise piped water supplies, disinfection at the water source may not adequately control them unless the disinfectant pervades the whole distribution system.”*

*“Acanthamoeba species cause both cerebral and corneal disease. An environmental source of infection has rarely been identified with certainty.”*

As free-living environmental organisms, *Naegleria* are not associated with faecal contamination of water and can be detected in the absence of *Escherichia coli*. Whilst only *Naegleria fowleri* has caused amoebic meningitis, other species of thermophilic *Naegleria* may indicate the potential presence of *Naegleria fowleri*.

Detection of any thermophilic *Naegleria* (also known as *Naegleria* tolerant to 42° C) in drinking water should therefore initiate corrective actions while speciation is undertaken to determine if *Naegleria fowleri* is present. A detection of thermophilic *Naegleria* in treated water may indicate that preventive measures and barriers have failed.

*Naegleria* are most likely to enter a water supply system at the source or at breaks in the distribution system, such as open reservoirs and tanks. Under favourable conditions, such as warm air and water temperatures, low water usage, stagnant water in pipes, inadequate chlorination and ample food source, they can proliferate in pipework and tanks. Under unfavourable conditions, *Naegleria* can encyst and when in this state are more resistant to disinfection, readily surviving in tank sediments and pipe biofilm. Unless chlorine residual is continuous and adequate, decystation to the active trophozoite form will remain a threat.

More detailed information can be found in Chapter 10 and the *Naegleria fowleri* fact sheet of the [Australian Drinking Water Guidelines](#).



## 4. Protocol for drinking water providers

*Naegleria* entering a distribution system during a barrier breach colonise the distribution system and may re-appear in the system when adequate residual is not maintained. Biofilms that form on the internal surfaces of water supply distribution system provides a bacterial food source and protection from environmental stresses, including chlorination. Biofilms can slough off or migrate into the drinking water from these biofilms reservoirs and make their way into the reticulation system.

Managing and monitoring bores and other raw water sources and maintaining adequate, permanent disinfection throughout the treatment, storage and reticulation system are thus critical to managing thermophilic *Naegleria* risk in drinking water supply systems.

Maintaining a free chlorine or chloramine residual at 0.5 milligrams per litre or higher will usually control *Naegleria fowleri*, provided the disinfectant residual persists throughout the water supply system at all times, the turbidity is low and biofilms are well managed.

In some circumstances 0.4 milligrams per litre of free chlorine residual is acceptable in the distribution system without being in breach of requirements, provided control of thermophilic *Naegleria* is maintained at all times and approval has been granted by the Department of Health WA.

Investigations carried out in Western Australia have shown that while 0.4 to 0.5 milligrams per litre of free chlorine was able to control the occurrence of *Naegleria fowleri* in the water stream in most circumstances, it was insufficient to eradicate the protozoön from biofilms coating the interior surface of some drinking water pipes. The research established that, for these circumstances, a constant free chlorine concentration greater than 1.0 milligram per litre is able to deactivate *Naegleria fowleri* from the bulk water and biofilm.

Following a thermophilic *Naegleria* detection, drinking water providers must aim for a free chlorine residual of at least 1 milligram per litre to re-establish control throughout the distribution system.

Drinking water providers are reminded that in most circumstances and water temperatures applicable in Western Australia, disinfection of drinking water supplies by ozonation or ultra violet irradiation only (that is, without a later step involving chlorination or chloramination) is unable to reliably control amoeba or biofilms throughout larger distribution systems, but may be effective in well-designed small distribution systems with cooler water. In many circumstances in Western Australia, *Naegleria* management will drive the level of residual, choice of disinfectant and disinfectant contact time required to provide microbiologically safe drinking water for consumers.

This protocol covers circumstances where drinking water is provided by a drinking water service provider with a licence issued under the *Water Services Act 2012*, or by an exempted entity under the *Water Services Act 2012*, or where there is a drinking water risk management plan that has been endorsed by the Department of Health, or an instrument established pursuant to the *Food Act 2008* or a local law made by a local government relevant to the quality of drinking water provided on the premises.

For rural properties or private properties not connected to a scheme drinking water supply, readers are referred to the general advice on the [HealthyWA Amoebic meningitis](#) page.



## 4.1. Monitoring requirements

Routine monitoring of drinking water supplies for thermophilic amoebae (the most significant of which is *Naegleria fowleri*) is required during the months of the year when water temperatures within the distribution system are likely to exceed 20° Celsius.

Drinking water providers must establish and monitor temperature profiles of water within the distribution system to determine the months of the year when the water temperature is likely to exceed 20° Celsius.

While amoebae may be detected below 20° Celsius, they are expected to encyst and to reduce to low numbers. Cysts are not believed to be infective, as they have not been recovered from brain tissue or cerebrospinal fluid. Sampling of water below 20° Celsius is optional.

Samples should be collected from the distribution system for thermophilic amoeba analysis at the same frequency and place as bacteriological samples, upstream of any end-of-line fitting in place that either filters or chills the water, or makes ice. This is because samples obtained from point-of-use filtered or chilled locations may underestimate the true risk, as they are not representative of the bulk distributed water received at fixtures such as shower heads or garden hoses where water may enter the nasal passage.

Drinking water providers who manage significant building plumbing or circulation systems that involve chilling water should ensure that their water chiller management protocols are compatible with the amoeba monitoring requirements set out in this protocol.

Sampling frequency at raw water sources or bores is recommended to follow obligations set out in the *Australian Drinking Water Guidelines* on water supply system management.

Greater sampling frequency may be necessary where bacteriological problems are detected or when hazardous events have occurred that may increase the risk of thermophilic *Naegleria* being present in drinking water (the term 'hazardous event' is defined and explained in section 3.2 of the *Australian Drinking Water Guidelines*).

Drinking water sampling must follow the Department of Health's "[Standard drinking water sampling procedure – microbiological](#)", noting that, unlike samples for bacteriological analysis, samples for amoeba analysis should not be chilled when sent to the laboratory.

A water sample of 250 millilitre volume is considered acceptable, although some techniques utilise a 500 millilitre sample volume. Samples must be transported at ambient temperature (do not include ice blocks) to the analysing laboratory within 24 hours (recommended) or within 96 hours (acceptable), according to the "[Australian Standard AS 2031: Water quality - Sampling for microbiological analysis](#)".

Samplers are reminded to ensure that water temperature and chlorine residual are also recorded with each sample, as well as clear labelling of site codes and text descriptors of the location being sampled, as well as any other relevant Chain of Custody requirements.



## 4.2. Analytical requirements

Testing of free living amoeba in water samples must be performed by a [National Association of Testing Authorities \(NATA\)](#) accredited laboratory. Results must be issued on a NATA endorsed report.

It is only necessary to confirm the species as either *N. fowleri* or not *fowleri*, as per the Polymerase Chain Reaction (PCR) method, which gives the quickest result. Other methods that involve speciation are acceptable, but are disadvantaged by being slower.

The PCR method examines water for free-living thermophilic amoebae by culturing on a seeded non-nutrient agar plate, followed by microscopic identification.

Amoebae are identified by the presence of cysts and sometimes trophozoites. Genus identification is possible at the cyst stage by their characteristic size and shape. The result will be reported as:

<b>Thermophilic amoebae</b>	<b>Not Detected or Detected / 250 mL</b>
<b>Thermophilic <i>Naegleria</i></b>	<b>Not Detected or Detected / 250 mL</b>

If thermophilic *Naegleria* has been detected, then the report will state:

<b><i>Naegleria fowleri</i></b>	<b>Pending</b>
---------------------------------	----------------

Identification of *Naegleria fowleri* is performed by the Molecular Diagnostics laboratory using Real-time PCR. This result will be available 1-3 days after thermophilic *Naegleria* has been identified by microscopy. The result will be reported as:

<b><i>Naegleria fowleri</i></b>	<b>Not Detected or Detected</b>
---------------------------------	---------------------------------

Please note that remediation is required upon detection of thermophilic *Naegleria*. Hence, the drinking water supplier (or client requesting the analysis) should ensure that arrangements have been made for the analysing laboratory to advise the drinking water supplier of this result as soon as possible, both by email and telephone communication.

Action by the drinking water supplier should be initiated upon confirmation of thermophilic *Naegleria*, not be delayed until the presence of *N. fowleri* is established.



### 4.3. Reporting protocol

Drinking water providers (including licensed water service providers, mine sites and non-licensed drinking water providers), or the relevant local Government if they arranged the monitoring, must notify the Department of Health WA of thermophilic *Naegleria* detections in drinking water (including *Naegleria fowleri*) in accordance with the following table:

Reporting Event	Result	Report to
Level 1	Confirmed <i>Naegleria fowleri</i> in drinking water	Environmental Health Directorate – immediate notification required Telephone: (08) 9222 2000 (working hours) Emergency Duty Officer (08) 9328 0553 (outside of working hours)
Level 2	Any thermophilic <i>Naegleria</i> (including repeats) in drinking water	Notification within one working day by email to: <a href="mailto:dwalert@health.wa.gov.au">dwalert@health.wa.gov.au</a>

Residual chlorine at the time of sampling must also be reported, as well as a PDF copy of the relevant NATA endorsed report (if one is available at that time).

Thermophilic *Naegleria* detections in drinking water are notifiable even in circumstances where an immediate response to the detection is to shut off that site from supply, or where a previous detection was reported in relation to the same incident.

Thermophilic *Naegleria* detections in non-drinking water (including at bores or surface water sources), or thermophilic amoebae detections in the absence of thermophilic *Naegleria*, are not notifiable, unless the drinking water provider reasonably forms the view that the results represent a risk to drinking water supplied to the public.

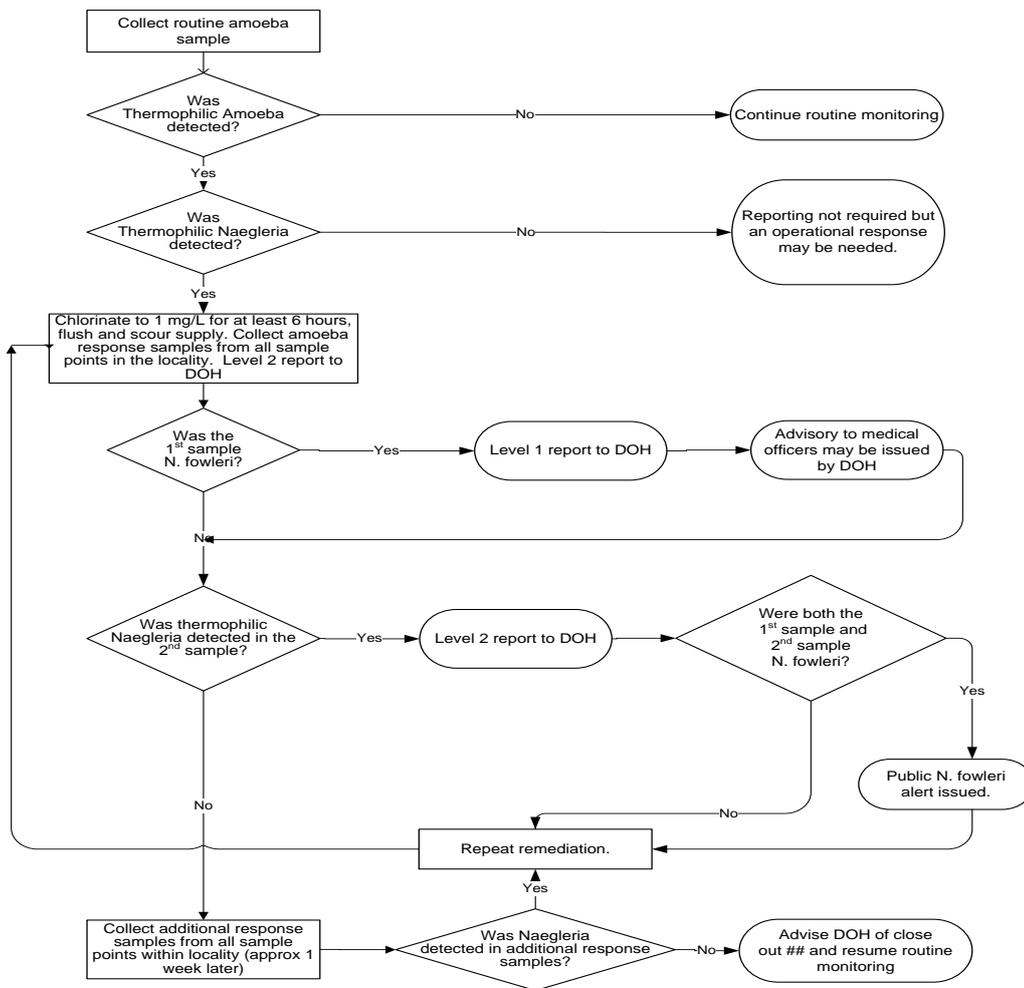
Drinking water providers must also refer to any relevant additional information in the reporting protocols set out in their Memorandum of Understanding for Drinking Water or their drinking water quality risk management plan.

Further response shall be in accordance with the response flowchart set out in section 4.4. The alerts and advisories referenced in the flow chart are explained in more detail in sections 4.5 and 4.6. Complete records of any incident or detection, including any short term and long term responses, shall be maintained. All notifiable incidents shall also be referred to in the relevant routine quarterly water quality report for that system.

Please note that for remote Aboriginal community water supplies where the Department of Communities is funded to provide a repairs, maintenance and water testing service under the Remote Essential and Municipal Services Program, a separate community notification procedure applies in the case of thermophilic *Naegleria* detections. These procedures involve pictograms and a cascading series of notifications by facsimile and email to community leaders, local clinics and the Department of Health WA (refer section 4.5.3).



## 4.4. Response protocol flowchart



Refer to response protocols of individual drinking water providers for more detailed responses relevant to the incident being managed.

## close out includes any necessary closure public announcements



## 4.5. Drinking water advisory notices and public alerts

### 4.5.1. Advisory to medical officers

In the event of a confirmed identification of *Naegleria fowleri* the Department of Health WA may, depending on the circumstances of the detection, circulate an advisory notice to regional hospitals and District Medical Officers based on this template:

**TO ALL DOCTORS IN THE \_\_\_\_\_ AREA**

Dear Doctor

**DETECTION OF *NAEGLERIA* IN THE DRINKING WATER SUPPLY**

I write to advise you that the (*Drinking Water Provider*) has detected *Naegleria fowleri* in the drinking water supply system of (*Locality*).

The (*Drinking Water Provider*) has increased disinfection processes and it is unlikely that repeat samples will detect further colonisation.

Although it is unlikely that any human illness will result from this colonisation I am writing to suggest a high index of suspicion if clinically presumptive cases are brought to your attention in the near future.

The symptoms of primary amoebic meningoencephalitis (PAM or amoebic meningitis) usually develop three to seven days after infection and include:

- Severe and persistent headache
- Sore throat
- Nausea
- Vomiting
- High fever
- Somnolence.

Neck stiffness is a characteristic sign. Recent anosmia or olfactory hallucinations, if present, are strongly suggestive. The cerebrospinal fluid is aseptic on lumbar puncture, and the amoebae may be mistaken for macrophages. Heroic treatment with intravenous and intrathecal amphotericin B and miconazole in conjunction with oral rifampicin is indicated for this **usually fatal condition**.

The disease is notifiable by telephone to the Environmental Health Directorate of the Department of Health WA on (08) 9222 2000, or the Communicable Disease Control Directorate on (08) 9222 0255 (office hours), or after hours via (08) 9328 0553.

Further general information is available on the Department of Health's website:

[https://ww2.health.wa.gov.au/Articles/N\\_R/Notification-of-infectious-diseases-and-related-conditions](https://ww2.health.wa.gov.au/Articles/N_R/Notification-of-infectious-diseases-and-related-conditions)

[https://healthywa.wa.gov.au/Articles/A\\_E/Amoebic-meningitis](https://healthywa.wa.gov.au/Articles/A_E/Amoebic-meningitis)

... or from local government environmental health staff, or by contacting the Department of Health's Environmental Health Directorate on (08) 9222 2000.

Yours faithfully



#### 4.5.2. Public *Naegleria fowleri* alert

The public *Naegleria fowleri* alert is to be issued jointly by the Department of Health WA and the drinking water provider following the Joint Agency Coordination Plan (JACP), or similar co-ordination process, if ***Naegleria fowleri* is detected in two consecutive samples** from the same drinking water supply system.

This alert will be circulated to the community and surrounding areas, the relevant local Government and the Department of Health's Environmental Health Directorate. The method of distribution (e.g media release, letter drop, mobile phones, word of mouth, social media) will be determined at the JACP meeting, or similar co-ordination process.

A suitable template is provided overleaf, either for use as a stand-alone public alert, or for incorporation into a media release.

Drinking water providers must also refer to any relevant additional information, including a list of responsible officers, in the reporting protocols set out in their Memorandum of Understanding for Drinking Water or their drinking water quality risk management plan.

When the incident is closed or the water supply system returns to being under effective control for amoeba management, a follow-up notice must be issued to the same community, indicating the updated circumstances or the return to normal, and providing any further information necessary or desirable for the community.

The wording and timing of the follow-up notice(s) will be determined by the circumstances and extent of the incident.



## Public *Naegleria fowleri* alert – draft template

Members of the (*Named*) community are advised that there have recently been detections of the amoeba *Naegleria fowleri* in the “*specific locality*” drinking water supply. Amoebae can occur when there are periods of sustained hot weather and lowered levels of chlorine in the water supply.

All actions are being undertaken by the “*Water Service Provider*” to maintain an adequate chlorine residual and due to this action the risk to the community is considered to be small. Nonetheless, as *Naegleria fowleri* can cause the rare but fatal illness amoebic meningitis (if water containing this amoeba goes up the nose), this alert has been issued.

To prevent infection:

- **DO NOT** allow water to go up your nose or a child’s nose and do not sniff water into your nose when bathing, showering or washing your face.
- **DO NOT** jump into or duck dive in bathing water – walk or lower yourself in.
- **ALWAYS** supervise children playing with hoses or sprinklers and teach them not to squirt water up their nose.
- **DO** run bath and shower taps for a few minutes to flush out the pipes.
- **DO** stay out of dirty pools, waterholes, dams, incorrectly chlorinated swimming pools, spas etc.
- **DO** keep your swimming pool adequately disinfected before and during use. Chlorine is the most effective way to continually disinfect water.
- **DO** keep wading pools clean by emptying, scrubbing and allowing them to dry in the sun after each use.
- If you need to top up the water in your swimming pool with tap water, **DO** place the hose directly into the skimmer box and ensure that the filter is running. **DO NOT** top up by placing the hose in the body of the pool.
- **DO** run all water from any hose or sprinkler for a few minutes until cool water flows through the hose before letting any child play with water from a hose or sprinkler.
- If the water in a hose or sprinkler remains warm even after flushing for a few minutes, **DO NOT** let children play with it.
- **DO** disinfect your swimming pool water with chlorine – chlorine is the most effective way to continually disinfect water as it kills all stages of the amoeba.
- **DO NOT** use tap water for nasal irrigation unless it has been further treated.

Please make sure your next door neighbours know about this alert.

Further updates will be issued as results of water samples become available.

*(provide contact details for further information)*

*(provide name and logos of issuing authorities)*

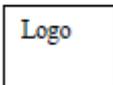


### 4.5.3. Naegleria notices for REMS communities

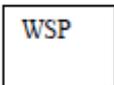
This section sets out samples of pre-agreed notification documents (including pictograms) used by the Department of Communities for the remote Aboriginal community water supplies under the Remote Essential and Municipal Services (REMS) Program, for:

- a *Naegleria* detection in drinking water;
- a simultaneous *Naegleria* and *E. coli* detection in drinking water; and
- an All Clear after the incident is concluded.





Government of Western Australia  
Department of Communities



Level 5, 503 Murray Street  
Perth WA 6000  
PO Box, 7181 Cloisters Square  
W6850 Australia

Date:  
WO#  
CSPM Notice Code:  
NC-004

To:  Community@email.com;  RSP@email.com

Cc:  Health@email.com;  Housing@email.com;  All <other@email.com>

From: REMS Water Quality Manager

Subject: Community Name – Month Year – Microbial Water Quality Result

The information contained in this facsimile is intended for the use of the authorised recipient only. If you are not the authorised recipient of this facsimile you must not read, copy store or distribute this facsimile, or disseminate or act on reliance upon the information contained in it. If you have received this facsimile in error, or you are not an authorised recipient, please telephone WSP Australia immediately on 08-9489 9700, and destroy all printed or electronic copies of this facsimile.

The water quality results for MM/DD/YYYY have indicated that the presence of Thermophilic Naegleria in the water in the water supply system of the ABCDEF community. The health risks are associated with recreational use of water, such as playing with garden hoses or swimming.

Summary of Results		
Sample Code	ZC7/9991	ZC7/9992
Date Sampled	DD/MM/YYYY	DD/MM/YYYY
E.Coli (cfu/100 ml)	None	None
Naegleria	Yes	None
Disinfection	Chlorine	Chlorine

**Community Office/Clinics**

It is important that this page and poster must be displayed on community noticeboards or where it can be publicly viewed.

**RSP/Contractor**

Please, arrange immediate remedial action (Default remediation unless otherwise instructed), complete the appropriate documentation from the REMS SRP and return to WSP. Please also arrange a re-sample as per REMS SRP as soon as possible once remedial action is complete.

**Community/Consumer**

Thermophilic Naegleria are not harmful if consumed, therefore we do not consider it necessary to boil water. However, be careful when playing with water or in the bath. Anyone playing with water needs to avoid getting water up their nose. If you have any questions, please call the REMS Water Quality Manager on (08) 9489 9700.

Regards

REMS Water Quality Manager



# Water quality alert: NO PLAY



## Water quality alert: playing with water

Be careful when playing with water, showering or in the bath. Anyone playing in or with water needs to avoid getting water up their nose.

For more information on any of the issues discussed above, contact:



**REMS Water Quality Manager**  
Ph: (08) 9489 9700  
Fx: (08) 9380 4060  
Email: [au.perwq@wsp.com](mailto:au.perwq@wsp.com)



Government of **Western Australia**  
Department of **Communities**

**Department of Communities**  
Simon Farrier  
Ph: (08) 9222 4944



Australian Government  
Department of **Health**

**Department of Health**  
Richard Theobald  
Ph: (08) 9222 2000



Logo

Government of Western Australia  
Department of Communities

WSP

Level 5, 503 Murray Street  
Perth WA 6000  
PO Box, 7181 Cloisters Square  
W6850 Australia

Date:  
WO#  
CSPM Notice Code:  
NC-003

To...  Community@email.com;  RSP@email.com  
Cc...  Health@email.com;  Housing@email.com;  All <other@email.com>

From: REMS Water Quality Manager

Subject: Community Name – Month Year – Microbial Water Quality Result

The information contained in this facsimile is intended for the use of the authorised recipient only. If you are not the authorised recipient of this facsimile you must not read, copy store or distribute this facsimile, or disseminate or act on reliance upon the information contained in it. If you have received this facsimile in error, or you are not an authorised recipient, please telephone WSP Australia immediately on 08-9489 9700, and destroy all printed or electronic copies of this facsimile.

The water quality results for MM/DD/YYYY have indicated that the presence of E.Coli and Thermophilic Naegleria in the water in the water supply system of the ABCDEF community. Unless the water is boiled these results indicate that the water is not suitable for human consumption and may pose a risk to public health. Additionally, there are also health risks that are associated with recreational use of water, such as playing with garden hoses or swimming.

**Summary of Results**

Sample Code	ZC7/9991	ZC7/9992
Date Sampled	DD/MM/YYYY	DD/MM/YYYY
E.Coli (cfu/100 ml)	6	15
Naegleria	Yes	None
Disinfection	Chlorine	Chlorine

**Community Office/Clinics**

It is important that this page and poster must be displayed on community noticeboards or where it can be publicly viewed.

**RSP/Contractor**

Please, arrange immediate remedial action (Default remediation unless otherwise instructed), complete the appropriate documentation from the REMS SRP and return to WSP. Please also arrange a re-sample as per REMS SRP as soon as possible once remedial action is complete.

**Community/Consumer**

All water at community should be boiled for at least one minute before using until the All Clear Notice is given. After boiling the water allow it to cool. Then the boiled water can be used for drinking, bathing, washing dishes, brushing teeth and food preparation. Also, be careful when playing with water or in the bath. Anyone playing with water needs to avoid getting water up their nose.

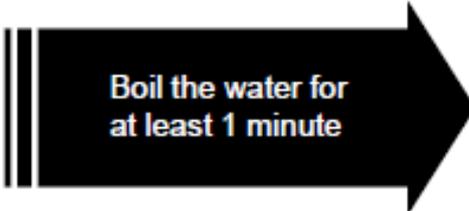
If you have any questions, please call the REMS Water Quality Manager on (08) 9489 9700.

Regards

REMS Water Quality Manager



# Water quality alert: **BOIL ALL WATER**



**After boiling the water allow it to cool**

Then the boiled water can be used for drinking, bathing, washing dishes, brushing teeth and food preparation.



**CAUTION:** Cool boiled water before use and keep children away from boiling water.

## Water quality alert: playing with water

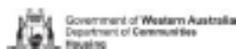
Also, be careful when playing with water or in the bath. Anyone playing in or with water needs to avoid getting water up their nose.



For more information on any of the issues discussed above, contact:



**REMS Water Quality Manager**  
ph: (08) 9489 9700 fx: (08) 9380 4060  
email: au.perwq@wsp.com



**Housing Authority**  
Simon Farrier  
phone: (08) 9222 4944



**Department of Health**  
Richard Theobald  
phone: (08) 9222 2000



# Water quality alert : ALL CLEAR



For more information on any of the issues discussed above, contact:



**REMS Water Quality Manager**  
ph: (08) 9489 9700 fx: (08) 9380 4060  
email: [au.perwq@wsp.com](mailto:au.perwq@wsp.com)



**Housing Authority**  
Simon Farrier  
phone: (08) 9222 4944



**Department of Health**  
Richard Theobald  
phone: (08) 9222 2000



#### 4.6. Advice for recurrent detections

With respect to *Naegleria* species, the requirement for drinking water supplies in Western Australia is that:

- no sample of drinking water should contain *Naegleria fowleri*;
- no more than one water sample collected in any 12 month period in each locality supplied by the water supplier shall contain *Naegleria* species tolerant to 42° Celsius or above; and
- if *Naegleria* species tolerant to 42° Celsius or above (i.e. thermophilic *Naegleria*) are detected, immediate corrective action must be taken.

More than one thermophilic *Naegleria* event in a drinking water supply in a 12 month period per locality is thus considered to be a recurrent problem.

Drinking water providers must follow a risk management protocol which, depending on the characteristics of the system, should include the following actions to prevent further detections or continue the response to an ongoing problem:

- Review operational limits to ensure a chlorine residual of at least 0.5 milligrams per litre persists in all parts of the reticulation at all times;
- Install chlorine boosters to ensure continuous residual above 0.5 milligrams per litre (where drinking water is piped over long distances);
- Increase cleaning frequency to minimise sediment build-up in storage tanks or reservoirs;
- Introduce flushing and scouring programs to control biofilm and sediment build-up in reticulation;
- Increase tank turnover rates and investigate potential for dead legs or stagnant areas, to reduce water age in the system.
- Maintain complete records of any incident or detection, including any short term and long term responses, and ensure that system operational plans remain up-to-date.
- Keep the public informed of any relevant update in circumstances, especially if the circumstances necessitate a change in consumer behaviour from the status quo.
- Assess raw water sources and other drinking water supplies systems managed by that drinking water provider to determine if they are similarly susceptible to contamination.

Drinking water providers are also reminded that it is possible that a thermophilic *Naegleria* detection may coincide with an *E. coli* detection or some other adverse event in the same supply system. The responses to these detections need to run simultaneously.

Drinking water providers must also ensure that all *Naegleria* related incidents in a drinking water supply are included in the quarterly drinking water quality reports reported to the Department of Health, as well as any published annual water quality report.



## 5. Swimming pools and aquatic facilities

Testing of water in aquatic facilities in Western Australia for amoeba (thermophilic *Naegleria*) and for bacteria is governed by Part 3 of the Health (Aquatic Facilities) Regulations 2007<sup>5</sup>.

Advice for operators of aquatic facilities, including mandatory responses to detections of thermophilic *Naegleria* in water in aquatic facilities, is set out in the “*Code of Practice for the Design, Construction, Operation, Management and Maintenance of Aquatic Facilities*”<sup>6</sup>.

The Environmental Health Directorate of the Department of Health also issues a routine summer reminder alert for members of the public and swimming pool owners statewide, in December of each year or at the onset of hot weather, in relation to microbiological risks from recreational waters and swimming pools.

Recent alerts are available from:

<https://ww2.health.wa.gov.au/Media-releases/Recreational-water-users-warned-of-disease-risk>

[www.healthywa.wa.gov.au/News/Amoebic-meningitis-warning-for-recreational-water-users](http://www.healthywa.wa.gov.au/News/Amoebic-meningitis-warning-for-recreational-water-users)

General advice for members of the public about keeping swimming pools and spas healthy is available from the HealthyWA web site, at:

[www.healthywa.wa.gov.au/Articles/S\\_T/Swimming-pools-and-spas](http://www.healthywa.wa.gov.au/Articles/S_T/Swimming-pools-and-spas)

[www.healthywa.wa.gov.au/Articles/S\\_T/Tips-for-keeping-your-spa-or-pool-healthy](http://www.healthywa.wa.gov.au/Articles/S_T/Tips-for-keeping-your-spa-or-pool-healthy)

[www.healthywa.wa.gov.au/Articles/S\\_T/Safe-use-and-storage-of-chemicals-for-your-pool](http://www.healthywa.wa.gov.au/Articles/S_T/Safe-use-and-storage-of-chemicals-for-your-pool)

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<sup>5</sup> Details, including the definition of an ‘aquatic facility’, at:

[www.legislation.wa.gov.au/legislation/statutes.nsf/main\\_mrtitle\\_2727\\_homepage.html](http://www.legislation.wa.gov.au/legislation/statutes.nsf/main_mrtitle_2727_homepage.html)

<sup>6</sup> Details at:

[https://ww2.health.wa.gov.au/Articles/J\\_M/Management-of-aquatic-facilities-in-Western-Australia](https://ww2.health.wa.gov.au/Articles/J_M/Management-of-aquatic-facilities-in-Western-Australia)



## 6. Nasal irrigation (netipots)

Tap water is usually not suitable for uses such as nasal irrigation without further treatment.

General advice about good practice for nasal irrigation (netipots) is available from:

[https://healthywa.wa.gov.au/Articles/N\\_R/Nasal-irrigation-is-it-safe](https://healthywa.wa.gov.au/Articles/N_R/Nasal-irrigation-is-it-safe)



## 7. Further reading

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## More information

Water Unit  
Environmental Health Directorate  
Public and Aboriginal Health Division  
Department of Health  
PO Box 8172  
PERTH BUSINESS CENTRE WA 6849

Telephone: (08) 9222 2000

Email: [ehinfo@health.wa.gov.au](mailto:ehinfo@health.wa.gov.au)

Web:

[https://ww2.health.wa.gov.au/Articles/A\\_E/Drinking-water](https://ww2.health.wa.gov.au/Articles/A_E/Drinking-water)

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[Figure 25E from <http://pathmicro.med.sc.edu/parasitology/blood-proto.htm>]

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