

Making sure your private water supply is safe

Groundwater

Many businesses and community groups use a private water supply for drinking water or food preparation. One common source of private water supply is groundwater. Groundwater includes water from bores, spear-points (shallow installations), springs or wells. Groundwater can be high quality if the source is well maintained and protected.

Unfortunately, groundwater can be contaminated by sewage, animal wastes and agricultural runoff (which may contain fertilisers and pesticides), industrial pollution, seepage from rubbish tips and polluted stormwater. If humans consume contaminated water, they can become very sick.

The law and you

If you are registered under either the *Food Act 1984* (Vic), Prescribed Accommodation Health (Prescribed Accommodation) Regulations 2001 or Residential Tenancies (Caravan Parks and Movable Dwellings Registration and Standards) Regulations 1999, **the law requires you to treat and manage your drinking water supply to make it safe for human consumption.**

The Food Act

The *Food Act* requires food businesses to use drinking water for food preparation at registered food premises. This includes water used for washing food ingredients, cooking, adding to food and drinks, making ice, cleaning, sanitising and hand-washing. Food businesses are required to record details of any private water supply and how it is managed in their food safety program.

How to ensure your water supply is safe

To keep your water supply safe for human consumption, you need to take the following steps:

- Step 1: Manage the risks to your private water supply
- Step 2: Treat the water to make it safe for drinking
- Step 3: Monitor and maintain the water supply system
- Step 4: Plan how to respond if an emergency occurs

What is a water supply system?

A water supply system includes everything from the collection of the water through to the point where the water is used for drinking (e.g. the tap). You may be required to describe your water supply system to an environmental health officer—please see Form 1 on page 7 to help you do this.

Source (bore/spearhead/well)



Storage tank (if applicable)



Treatment (filtration/disinfection)



Use

Step 1: Manage the risks to your water supply

Groundwater is at risk from sewage, animal wastes, agricultural runoff (which may contain fertilisers and pesticides), industrial pollution, seepage from rubbish tips and polluted stormwater. Once collected, groundwater can also be contaminated by the tank itself, and the pipes used to distribute the water.

In addition, some groundwater in Victoria contains chemical contaminants, such as arsenic, which can cause illness in people who drink the water. Some salts that occur naturally in water, including sulphate and nitrate, can be harmful if they are present in large quantities. Other dissolved salts can make the water hard. This may result in scale build-up and

corrosion in pipes, which can release harmful metals such as lead and copper into the water.

If you do not protect your groundwater supply from potential contaminants, chemicals and disease-causing bacteria may be introduced into your drinking water. Please refer to Table 1 on page 6 to read more about how groundwater can be contaminated and how you can reduce the risks.

You may find it useful to draw a diagram of your water supply, including buildings and other facilities, to help identify any risks to your water. Please see Form 1 on page 7 to help record information about your water supply system.

Step 2: Treat the water and may make it safe for drinking

Once you have identified the risks, you need to treat your water supply.

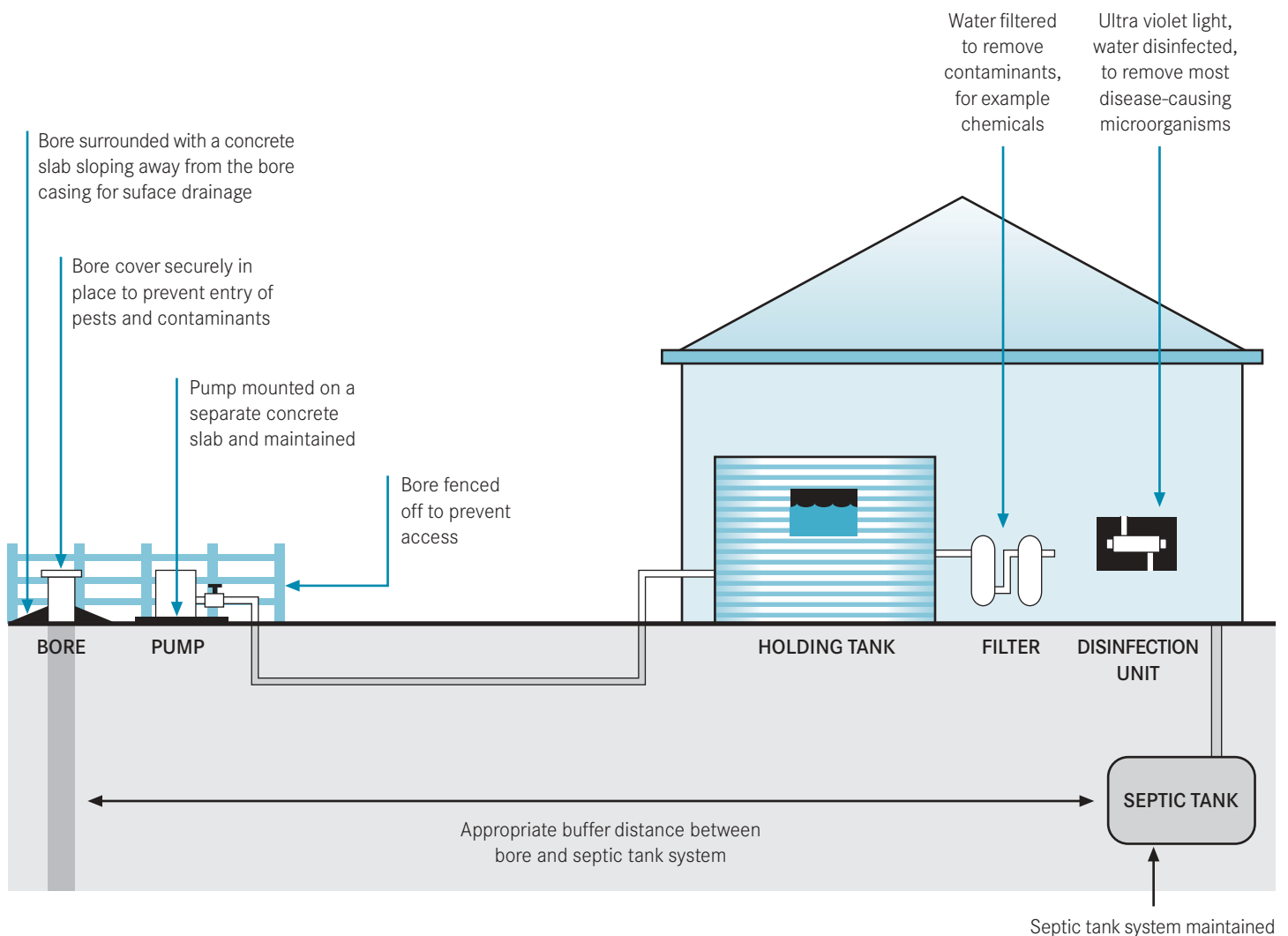
The most common ways to treat groundwater include:

- filtration
- disinfection (ultraviolet light and chlorine).

To help select the most appropriate method to treat your water, you should firstly consult a water treatment professional.

When you have a treatment process in place, you should keep records of water supply inspections and test results (for at least two years). An environmental health officer from your local council has

How to avoid or minimise problems to your water supply



the authority to ask for these records and sample the water for compliance against the *Australian Drinking Water Guidelines 2004* at any time.

If you cannot show that your drinking water has been appropriately treated, the environmental health officer can sample the water for compliance and you will have to pay the costs.

Please see Form 2 on page 8 to help you gather information for your records.

Filtration

Different types of filters can remove particular contaminants within the water. Filtration can remove sediment, chemicals, algal toxins (which are a specific type of chemical) and microorganisms.

Filters are commonly installed with your regular plumbing between the bore and the point where the water is disinfected. It is normally used in combination with ultraviolet light and/or chlorine disinfection.

Disinfection

Disinfection is generally the last step of water treatment and will remove most disease-causing microorganisms. It is important to realise that disinfection will not remove chemical contamination.

Ultraviolet light disinfection

Ultraviolet (UV) light is a common and effective form of disinfection, which kills many kinds of microorganisms. A UV disinfection system can be installed with your regular plumbing before the point of use (e.g. the kitchen tap).

Filtration to remove sediment often needs to occur before the water reaches the UV disinfection unit—because UV light cannot penetrate dirty or clouded water. For best results, you should use UV disinfection either at the point of use or in combination with chlorination.

UV disinfection systems need to be designed and installed by a water treatment professional.

Chlorine disinfection

Chlorine is often used to disinfect groundwater because it is accessible, economical and can treat large volumes of water. Water can be chlorinated either through an automatic dosing system within your regular plumbing or manually added when water is stored in a tank before use.

It takes about 5 milligrams of chlorine per litre to disinfect the water in your tank. However, this will depend on the quality of the water. For effective disinfection there should still be at least 0.5 milligrams per litre (mg/L) present in the water 30 minutes after dosing the water.

The testing can be done with a suitable chlorine test kit (e.g. a swimming pool kit). If the measured chlorine is below 0.5 mg/L, repeat chlorine dosing until this level is reached. Please read the information in the box below for specific instructions on chlorinating a tank.

How to treat water stored in a tank

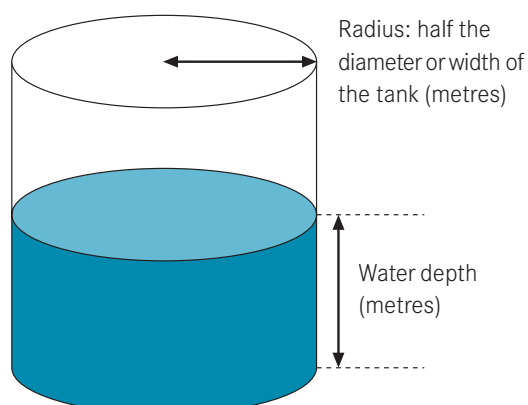
To work out how much chlorine to add to your tank for disinfection, first you need to calculate the amount of water in your tank.

Rectangular/square tanks

Volume (litres) = depth of water in tank (metres) X tank width (metres) X tank length (metres) X 1000

Cylindrical tanks

Volume (litres) = depth of water in tank (metres) X tank radius (metres) X tank radius (metres) X 3140



Determining the amount of chlorine to add

Firstly, the turbidity (cloudiness) of the water should be below a measure of 1 (nephelometric) turbidity unit and secondly, the pH of the water should range from 6.5–8.5. You can arrange a water-testing laboratory to check the turbidity of your water supply and test the pH yourself with a swimming pool kit. If the pH level is out of range chlorine disinfection is less effective and you will need to consult with a water treatment professional.

When the turbidity and pH is satisfactory, an initial dose of chlorine less than 5 mg/L may be sufficient to achieve the desired 0.5 mg/L after 30 minutes.

Chlorine is available in a number of different forms. As a general guide, you will need to add:

125 millilitres (mL) of liquid bleach (4% available chlorine) for every 1000 litres (L) of water in your tank

OR

40 millilitres (mL) of liquid sodium hypochlorite (12.5% available chlorine) for every 1000 litres (L) of water in your tank

OR

8 grams (g) of granular calcium hypochlorite (65% available chlorine) for every 1000 litres of water in your tank.

The following table estimates the amount of different preparations of chlorine that should be added to various volumes of water to provide an initial concentration of 5 mg/L.

You can buy liquid household bleach at a supermarket or hardware store. Check the product has at least four per cent (4%) available chlorine and has no additives such as fragrances or detergents.

You can buy sodium hypochlorite and calcium hypochlorite at large supermarkets, hardware stores or swimming pool suppliers. Stabilised chlorine (which contains isocyanuric acid) is not effective in enclosed tanks and should not be used.

How to prepare chlorine

When adding the concentrated chemical mixture to the tank, first mix the chlorine solution with cold water in a plastic bucket in the open air, then add to the tank and let it stand for at least one hour (ideally 24 hours) before use.

Always add chlorine to water, never water to chlorine and use appropriate protective equipment including gloves and goggles. Always follow the manufacturer's handling and storage instructions.

All chlorine products are required to be replaced on a regular basis as chlorine activity declines over time.

If you are uncertain about this procedure, contact an environmental health officer from your local council or the Department of Human Services for advice.

Volume of water in tank (L)	Amount of chlorine to add to achieve 5mg/L in tank		
	4% liquid bleach (mL)	12.5% liquid sodium hypochlorite (mL)	65% granular or powdered calcium hypochlorite (teaspoon)
1000	125	40	2
2000	250	80	3
5000	625	200	6
6000	750	240	7
7500	938	300	9
10000	1250	400	12
16000	2000	640	19
20000	2500	800	24
30000	3750	1200	35

Step 3: Monitor and maintain the water supply system

All treatment methods require regular monitoring to make sure they are working properly.

The three treatment processes outlined in Step 2—filtration, UV disinfection and chlorine disinfection—specifically require the following monitoring:

Filtration

You must regularly maintain and replace filters for them to be effective. If not, bacteria can grow on the filters and then be released into the filtered water. The manufacturer's operating and maintenance instructions must be carefully followed.

Chlorine disinfection

At the point where the water is used (e.g. at the kitchen sink), you need to test the chlorine level weekly or after heavy rainfall to check the level of disinfectant in the system. The level of chlorine in the water needs to be at least 0.5 mg/L.

When the water supply has not been used for some time, such as more than one week, you should check the chlorine level and flush the pipes for a few minutes until fresh water flows through from the tank. Water flushed from the system is safe to use on the garden.

Keep a record of chlorine and pH readings.

Ultraviolet light disinfection

Ultraviolet light disinfection systems need regular and careful maintenance to ensure they remain effective by:

- providing a reliable power supply to the lamp
- maintaining or replacing the filter unit regularly or in accordance with the manufacturer's instructions
- checking on a weekly basis that the lamps are operating and free from scum
- replacing the lamps every six months or in accordance with the manufacturer's instructions
- keeping a record of inspections and maintenance.

Testing the quality of your water

In certain circumstances, you may need to ask a water-testing laboratory to check the quality of your water supply.

The quality of the water should be tested:

- before using the water from a new treatment system
- after a treatment system has been altered
- after a significant event that may have affected water quality, such as heavy rains or bushfires.

For water testing, water samples should be sent to a laboratory accredited by the National Association of Testing Authorities (NATA) to ensure the highest level of accuracy. You can also contact your laboratory to find out about sampling protocol and obtain sampling bottles. Look in the business telephone directory under the heading 'Analysts' to find a laboratory in your area or contact your local council.

Taking corrective action

You may need to take 'corrective action' when monitoring shows that something is wrong with your water supply system. This may include:

- changing filter cartridges or undertaking other maintenance work on water treatment systems
- installing new or different water treatment systems
- increasing the chlorine dose
- emergency disinfection
- stopping the supply, putting up warning signs or notifying water users if the water is suspected to be unsafe
- repairing bores and bore covers

It is important that you record any corrective action to show you have taken the necessary steps to make your water supply safe.

Step 4: What to do in an emergency

Unusual events can contaminate water supplies that are normally clean. These events might include heavy rain, dead animals, bushfires or equipment failure. If you suspect that your supply has been contaminated, it can be boiled before being used for drinking or food preparation or manually disinfected with chlorine. However, these methods will not remove chemical contaminants.

If the water has been heavily contaminated, such as from floods or bushfires, the microbiological or chemical levels may have to be tested at a water-testing laboratory to make sure that your water is safe. Your local environmental health officer will be able to provide advice on how you should treat your water.

If the water cannot be treated to a standard safe for drinking, you should provide an alternative drinking water supply until the normal water supply is shown to be safe.

Boiling

Bringing water to the rolling boil is an effective means of disinfecting small amounts of water quickly. Water should be boiled for at least one minute to disinfect it.

For good-quality water supplies, simply bringing the water to the boil is usually sufficient for disinfection. You can use an electric kettle with an automatic shut-off for this purpose. After boiling, allow the water to cool and keep it in a clean container until it is needed.

It is important to note that **coffee machines do not boil water**. Water must be treated before being dispensed into coffee machine.

Carted water

In some circumstances you may need to top up your tank with carted water. Carted water must be drinking quality and obtained from a clean source, i.e. a registered 'standpipe', and transported in clean, sealed, food-grade containers.

You should only buy water from a water carter who can demonstrate they supply safe drinking water. They should also follow the *Guidelines for Drinking (potable) Water Transport in Victoria*. These guidelines are available at www.health.vic.gov.au/foodsafety.

Your tank should be cleaned before the water is delivered to prevent any sludge being re-suspended or taste and water-quality issues. If the tank has not been cleaned before delivery, a settling period followed by treatment (such as disinfection) may be needed.

Further information

If you want to know more about private water supplies, go to the *Guidelines for private drinking water supplies at commercial and community facilities* at www.health.vic.gov.au/foodsafety.

Table 1: Common sources of groundwater contamination and how you can reduce the risks

System component	Source of contamination	How to reduce the risks
Bore	Surface water runoff	<ul style="list-style-type: none"> • Raise bore head above ground, surface drainage flows away from the bore head • Bore should be surrounded with a concrete slab sloping away with the bore casing protruding above the slab • Bore cover is securely in place and free from holes or cracks • Bore casing is intact. Inspect for stains below joints and seepage through cracks inside of casing • Livestock fenced 50 metres off from bore • Water treatment (filtration and disinfection) • Regular inspections
	Sub-surface contaminants	<ul style="list-style-type: none"> • Avoid extracting water from sites with known contaminants, including heavy industrial and intensive agricultural areas • Test the source water for chemicals • Water treatment (filtration and disinfection)
	Sewage	<ul style="list-style-type: none"> • Buffer distance between bore and wastewater disposal system to comply with the Code of Practice—onsite waste water management. Contact your local council's environmental health officer for further advice • Maintain septic tank system • Water treatment (filtration and disinfection)
	Naturally occurring chemicals within water	<ul style="list-style-type: none"> • Test the source water against the Australian Drinking Water standards • Install a filter
	Leaching from bore casings, pipes or plumbing materials	<ul style="list-style-type: none"> • All materials in contact with water to comply with Australian Standards 4020:2005 • Regular inspections
Pump	Chemical spillage	<ul style="list-style-type: none"> • Engine mounted on a separate concrete slab • Fuel or oil spillage is prevented from getting in the bore • Pump maintained to prevent deterioration of fuel and lubricant lines
Storage tank	Birds, animals, insects, algal growth	<ul style="list-style-type: none"> • Install screens on all tank inlets and overflows with maximum 1 mm mesh • Cover tank with lightproof cover • Regular inspections • Water treatment (filtration and disinfection)
	Sediment built up within the tank	<ul style="list-style-type: none"> • Clean regularly (minimum every 2 years) • Clean before receipt of carted water • Draw-off point for taking water from the tank is at least 150mm above the base of the tank (or as specified by the manufacturer)
	Tank materials	<ul style="list-style-type: none"> • Storage tanks comply with Australian Standards 4020:2005 (not applicable for concrete tanks)
In-ground storage tank	Tank materials	<ul style="list-style-type: none"> • Structurally sound • Chemical adjustment of pH in new concrete tanks
	Seepage from surface water / sub-surface water, e.g. sewage from septic tank	<ul style="list-style-type: none"> • Properly designed and sealed to prevent entry of surface or sub-surface water • Tank not buried in land contaminated with chemicals. • Buffer distance between tank and wastewater disposal system to comply with the Septic Tank Code of Practice Contact your local council's environmental health officer for further advice • Water treatment (filtration and disinfection)
Distribution lines	Stagnant water in pipes	<ul style="list-style-type: none"> • Pipe work should be flushed if not used for some time, e.g. more than one week • Pipes should be self draining or manually drained every 6 months
	Pump and plumbing materials	<ul style="list-style-type: none"> • Buried pipes should be installed away from (and shallower than) septic tanks or wastewater pipework • All materials in contact with water comply with Australian Standards 4020:2005

Form 1: Describe the water supply system

You must be able to describe your water supply system to an environmental health officer.

Use this form to record details about your water supply system.

Water source(s)

- Rainwater
- Ground water
- Surface water
- Dam
- Creek/Stream

Uses of the supply

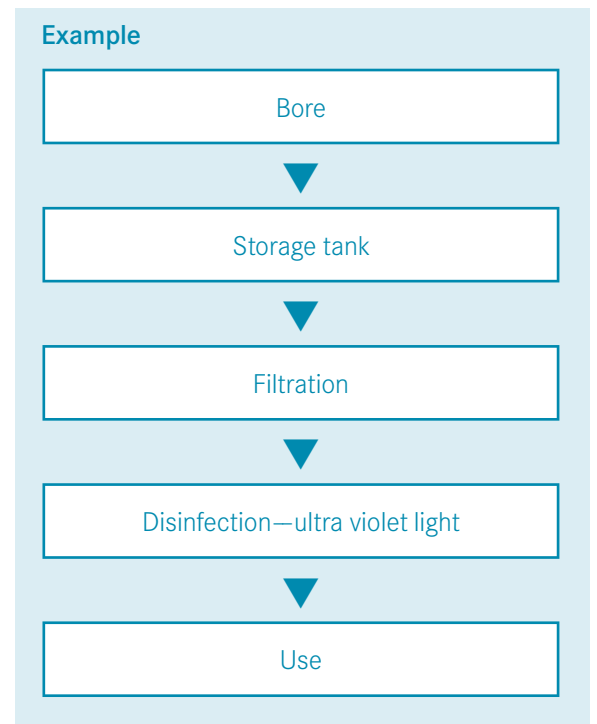
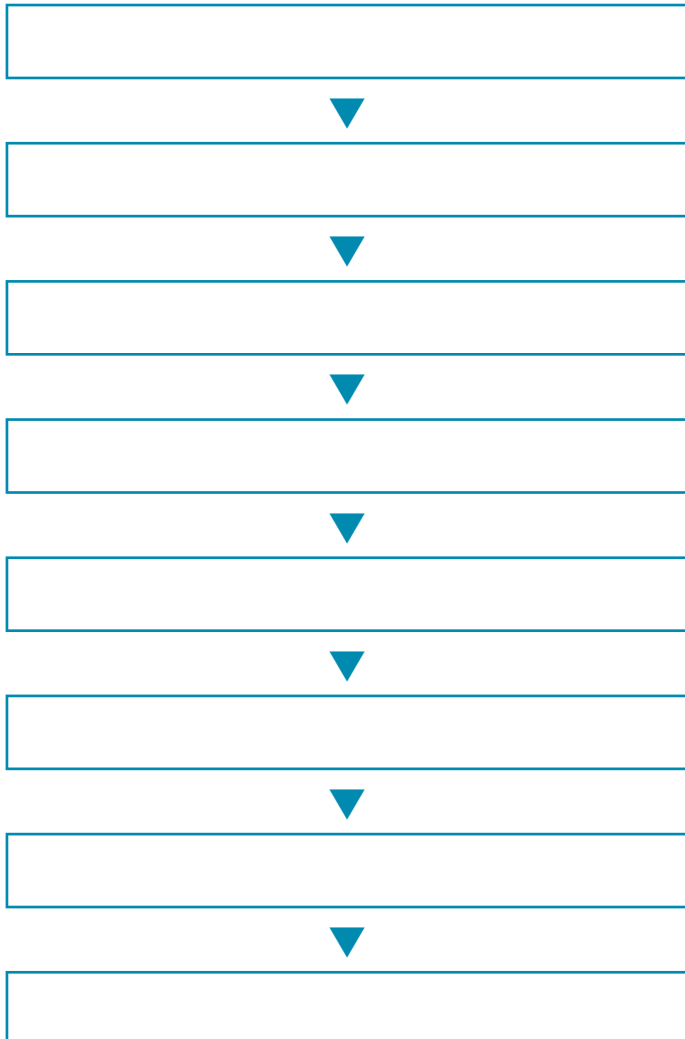
- Drinking
- Food preparation
(including cleaning food preparation surfaces)
- Hand washing
- Bathing
- Other, please explain

Treatment methods

- Filtration
- Disinfection
- Chlorine
- UV light
- Other, please specify

Map of system

Use this flow diagram to map your system. Include your water source, storage tanks and treatment systems.



Form 2: Checklist for inspecting and maintaining your water supply

Local councils require businesses and community groups with private water supplies to keep records of system inspections and test results for at least two years. Use this form to help you gather information for your records.

List of items to be inspected and maintained

Water source—Groundwater
Check the bore head and any other mechanism installed is watertight and protected from surface water flows (monthly)
Check bore is protected, e.g. fences, locks (monthly)
Check maintenance and operation of the pump (monthly)
Tank (if applicable)
Check inlet and outlet screens (3 monthly)
Check access covers (3 monthly)
Check presence of mosquito larvae in tank water (3 monthly)
Check structural condition (annually)
Check sludge level and internal cleanliness (every 2 years or as required)
Distribution system
Check plumbing/piping is fully operational and well-maintained (annually)
Treatment system (where applicable)
Clean/replace filters (as per manufacturer's advice or earlier if a decrease in water flow is noticed)
Test chlorine level is at or above 0.5mg/L (weekly)
Test pH level is 6.5–8.5 (weekly)
Check UV light is operating and visually free from scum (weekly)
Replace UV light system (every 6 months or as per manufacturer's advice)
Other treatment:
Water quality testing
<i>E. coli</i> test—as per Australian Water Drinking Guidelines values (initially to identify risk, when the system is new or altered, or after a significant event)
Chemical test—as per Australian Water Drinking Guidelines values (initially to identify risk, when the system is new or altered, or after a significant event)

You must be able to demonstrate to your local council that you are inspecting and maintaining your water supply.

Use these forms to record your inspections and test results.

3 monthly inspections—Groundwater			
Inspection date	Inspected by	Corrective actions	Date of next inspection
Tank (if applicable)			
Check inlet and outlet screens (3 monthly)			
Check access covers (3 monthly)			
Check presence of mosquito larvae in tank water (3 monthly)			

6 monthly inspections—Groundwater			
Inspection date	Inspected by	Corrective actions	Date of next inspection
Treatment system (where applicable)			
Replace UV light system (every 6 months or as per manufacturer’s advice)			

Annual inspections—Groundwater			
Inspection date	Inspected by	Corrective actions	Date of next inspection
Tank (if applicable)			
Check structural condition (annually)			
Distribution system			
Check plumbing/piping is fully operational and well-maintained (annually)			

You must be able to demonstrate to your local council that you are inspecting and maintaining your water supply.

Use these forms to record your inspections and test results.

2 yearly inspections—Groundwater			
Inspection date	Inspected by	Corrective actions	Date of next inspection
Tank (if applicable)			
Check sludge level and internal cleanliness (every 2 years or as required)			

Infrequent inspections—Groundwater			
Inspection date	Inspected by	Corrective actions	Date of next inspection
Treatment system (where applicable)			
Clean/replace filters (as per manufacturer’s advice or earlier if a decrease in water flow is noticed)			

Date tested	Corrective actions
Water quality testing	
<i>E. coli</i> test—as per Australian Water Drinking Guidelines values (initially to identify risk, when the system is new or altered, or after a significant event)	
Chemical test—as per Australian Water Drinking Guidelines values (initially to identify risk, when the system is new or altered, or after a significant event)	

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