



Water quality protection note 41

April 2015

Private drinking water supplies

Key message

Both groundwater and surface water will contain dissolved minerals, chemical residues and microorganisms, which may pose a risk to your health and comfort, and make the water unfit for human consumption. You should always obtain your drinking water from a safe source (treated and regularly tested) so its quality continuously meets health guideline values for drinking water. If you are in doubt about your water quality, then you should arrange testing of your water supply and get expert advice on its suitability for your intended use.

Purpose

Private water supply sources make up more than 80 per cent of all water used in Western Australia. They can appear clean, fresh and aesthetically pleasing, but they may contain microscopic and dissolved contaminants, from natural or contamination sources. Unlike reticulated drinking water supplied by licensed service providers, which are safely protected using a range of contamination barriers, private water supplies normally don't receive the same level of protection. Water agencies use the management framework in the *Australian drinking water guidelines* (reference 1b) which includes catchment controls on risky land use activities, blending of water from multiple sources and water treatment with associated monitoring. This note is designed to increase awareness of water quality issues, advise on potential risks and offer measures that may be taken to protect private water supplies taken from roof runoff, surface waterways or groundwater.

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 re-use. This note offers:

- our current views on water supplies for rural dwellings, remote communities, holiday resorts, mining camps, industrial sites and isolated sites where scheme water supplies are impractical
- a guide on acceptable practices used to protect the quality of Western Australia's water resources.

This note provides a general guide on issues of environmental concern, and offers potential solutions based on professional judgement and precedent. The recommendations do not override any statutory obligation or government policy. Alternative practical environmental solutions suited to local conditions should be considered. The recommendations should not be used by regulators in place of a site-specific assessment of any project's environmental risks. Regulatory conditions set should

consider the values of the surrounding environment, the safeguards in place, and take a precautionary approach. The note shall not be used as the departmental policy position on a specific matter, unless confirmed in writing.

Scope

The information in this note may apply to water supplies drawn from lakes, rooftops, stored stormwater runoff, springs, underground sources (aquifers) or waterways for:

- domestic use (including drinking, kitchen, bathing, laundry and toilet flushing) at private dwellings, mining camps (not licensed by the Economic Regulation Authority), holiday resorts and farmstays
- recreational contact (swimming pools and spas)
- processing of food and beverages
- irrigation of crops such as fruits and salad vegetables that are consumed raw.

Water quality in the environment varies with time, location and land use and may not meet the criteria published in the *Australian drinking water guidelines* (reference 1b). This note recognises that water harvested by individuals may not be effectively treated or tested prior to use, and hence may pose risks to people's health.

This note does not apply to community drinking water (reticulated scheme) supplies, treated and recycled wastewater schemes or drinking water for animals (stock supplies).

Influences on water quality

Contaminants responsible for causing a risk to water quality can be naturally occurring in the environment or be linked to land use activities in the surrounding catchment.

The natural environment

Colour derived from plant tannins, hard (calcium-rich) or acidic water, salts, metals, hydrogen sulfide (produces a rotten egg odour) and microorganisms are naturally present in the environment.

Contaminants may occur at concentrations that make a water source unsuitable for specific uses unless treated. Typically high concentrations of natural salts in groundwater may make it unsuitable for drinking or irrigation. On occasion, water quality may be made worse by human activity, such as turbidity and salinity from land clearing. Acid sulfate soils may produce metals released from carbon-rich, oxygen-depleted soil, such as in peat swamps, as groundwater table levels fall during low rainfall periods.

Agricultural chemicals

Chemicals (fertilisers or pesticides) applied to land, but not fully used by vegetation or naturally degraded by air, sunlight and soil microorganisms, can leach off-site or into the groundwater and degrade water quality. Residue from fertiliser used to grow crops may contaminate a downstream landowner's drinking water bore with excessive nitrate.

Animal wastes and manures

Animals (including birds, rodents and frogs) may be a source of microbes that cause a disease risk. For example, *Salmonella* bacteria can pass to humans or animals when waste comes into contact with water in the environment. Nutrients from wastes can also cause algae growth problems in streams, dams and open tanks.

Chemical spills and leakage from holding facilities

Small chemical spills and leaks may appear innocuous. However, if the substance is toxic and mobile in the environment, or if the discharge is frequent, long-term or widespread, it may pose a major cumulative risk to the quality of water supplies.

Sewage

Human waste is a source of disease because infective organisms are present in the community. Poorly designed or operated sewage treatment and disposal practices (such as badly sited or maintained septic tank systems) can recycle harmful microorganisms back into the community via its water supplies. Cholera and typhoid epidemics remain problems in many countries without adequate sanitation practices. Regardless of the provision of sewerage schemes and modern on-site wastewater treatment systems, sporadic problems remain with gastro-enteritis and parasite infections that may be linked to poorly protected water sources. Partly treated sewage also contributes nutrients into water resources. These nutrients can raise health concerns based on nitrate levels and foster algal blooms.

Waste disposal

Waste materials (including organic waste from animals and plants, engine oil, metals and chemicals deposited at domestic or industrial sites and land-fills) with poor containment or porous soil can leach pollutants into underlying groundwater or adjacent water systems. Rainfall percolation can carry waste residues into both surface water and groundwater. Pollutants may move large distances in stormwater runoff or via groundwater flow and eventually reach and contaminate water supply dams or bores. In an urban environment, a container of used engine degreaser poured onto the ground could contaminate bore water used for irrigation affecting gardens or children playing under a sprinkler.

Common pathways for contaminant transfer to water resources include:

- wash-off of chemical residues from land into stormwater and agricultural drains or watercourses following rainfall
- leaching from poorly sealed waste holding dams into groundwater
- contaminant entry to water bore casings that are poorly sealed against water intrusion near the ground surface
- misuse or disposal of chemicals near waterways and within catchment areas
- human or animal waste deposited in or adjacent to waterways.

Will harmful water contaminants be naturally removed in the environment?

Some substances may be naturally retained within the soil, or decayed by naturally-occurring microorganisms, but many will remain mobile and can enter water supplies. The outcome largely depends on the degradability of the substance and whether soil properties can filter out or chemically bind contaminants.

The time taken for contaminants to reach a private water supply source can be important, as many substances take a long time to naturally degrade, especially if warmth, oxygen and decomposition microorganisms are limited.

Some positive factors to consider:

- When beds of clay, silt or solid rock confine groundwater, a surface contaminant may not be able to easily reach a deep water source.

- Many modern pesticides are only active in the environment for a few days and then naturally break down (biodegradation) in the presence of sunlight, air and soil microorganisms to form relatively harmless substances.
- The water source may be effectively treated and routinely tested as safe.
- Some aquifers have a natural 'sand filtering' ability which can eliminate or reduce microbes.

Some negative factors:

- Some waters may move too fast for biodegradation to occur, such as in stormwater or waterways.
- Some contaminants are highly toxic, mobile and do not degrade in the environment such as salts, poly-chlorinated biphenyls (PCBs) and now banned organo-chlorine pesticides (such as dieldrin).
- You can never be sure whether a neighbour is using chemicals responsibly or whether a toxic spill residue may threaten your water supply.

Water quality risks

Risks to water quality may range from aesthetic problems (such as colour, odour and taste), operational nuisance issues (such as sediment), damage to pipework and equipment such as corrosion, or health problems in people or animals. Potential water quality risks are summarised below.

Physical characteristics:

- colour
- foam or suds
- suspended solids
- odour
- taste
- skin/eye irritation.

Chemical contaminants:

- excessive salts (such as chloride, sulphate and nitrates)
- metals (such as arsenic, copper, iron, lead, manganese, mercury, nickel and zinc)
- poisons (arsenic, cyanide, pesticides)
- petroleum derivatives (fuels, lubricants and solvents)
- radioactive substances.

Pathogens (microorganisms that cause health problems):

- bacteria (such as those causing cholera, dysentery, gastro-enteritis, *Salmonella*, or streptococcal infections)
- viruses (such as hepatitis)
- parasites that cause gastro-enteritis (*Giardia* and *Cryptosporidia*) and worms
- toxic algae (such as cyanobacteria) and fungi.

Advice and recommendations

Untreated water taken from the environment may be **unsafe for human consumption**.

People who drink untreated water drawn from surface water bodies and shallow groundwater (aquifers receiving direct recharge from the surface) are taking a health risk, especially where there is significant human activity or agriculture in the surrounding catchment. The acute health threat is from pathogens (disease-causing microorganisms). Chemical residues (detectable via scientific analysis) may also mainly cause chronic health effects. Detecting water contamination using our eyesight, sense of taste and smell is unreliable. Pathogens and some chemicals are odourless, tasteless and invisible to the naked eye.

Drinking water supply options

- 1 Rainwater tanks that collect runoff from building roofs can be installed (with safeguards to reduce impact of airborne contaminants). Areas in the south-west of the state with an average annual rainfall of about 750 mm, a roof area of 150 m² may yield around 100 kL of water in a normal rainfall year.
- 2 About 100 kL is sufficient for a family of four to meet annual kitchen (20 kL) and bathroom (50 kL) needs (excluding toilet flushing and laundry use) with a safety margin for variable rainfall. Lower rainfall areas will yield a lesser supply.
- 3 To access regional climate data and Department of Health information on local water sources and your health, see references 2 and 6. The publication by Engineers Australia *Australian rainfall and runoff* (reference 8) provides advice on estimating rainfall runoff into collection systems.
- 4 Vermin and dust should be screened from water tanks. The inflow from the first wet season rainfall should be diverted to waste as it has a high risk of containing contaminants. The government may provide subsidies for water-saving devices such as rainwater tanks in scheme water supply areas. At least two tanks are often required by regulatory agencies to maximise security of water supplies.
- 5 Contractors can supply bulk water deliveries from a clean source to storage tanks. The Department of Health has guidance brochures on carted water (reference 6). Sources may include a metered standpipe connected to a reticulated scheme water supply. Connection details and costs are available from water service providers such as the Water Corporation. Storage tanks should be fully enclosed to exclude light, vermin and airborne contaminants.
- 6 Commercially bottled water is another alternative.
- 7 For short-term needs, large, clean, plastic containers filled from a nearby public water supply scheme may be used. These containers should be clearly marked *drinking water* and never used for other purposes.
- 8 Where possible, a deep bore drawing water from a confined aquifer is preferred. Confined aquifers are naturally protected from surface contamination by thick layers of clay, rock or shale. The water is less likely to contain pathogens, nutrients and chemicals (from land uses), but may still contain salts and potentially harmful, although naturally occurring, minerals. You need to apply for a groundwater licence from the Department of Water to sink a bore into a confined aquifer. Contact the nearest Department of Water regional office for more information.
- 9 Regular water sampling and analysis should be arranged prior to using any groundwater source for drinking water or irrigating food. The analysis of bore water

sources should follow the recommendations made in Chapter 10 of the *Australian drinking water guidelines* (reference 1b).

- 10 Any drinking water should be adequately disinfected to control pathogens. Chemical treatment or filtering may be needed to remove physical or chemical contaminants.
- 11 Install an on-site water treatment system. This may be costly and requires regular replacement of components such as filters and disinfecting materials. Water treatment skills and experience, routine equipment maintenance and regular water quality monitoring are needed to sustain treatment performance. Advice on the performance of water treatment systems is available from reputable water treatment and equipment suppliers.
- 12 Commercial treatment systems, installed at the tap, such as cartridge filtration, reverse osmosis, activated carbon and ultraviolet disinfection (with lamp failure alarm) systems can be effective if adequately matched to the chemistry of the local water source when determined by regular chemical analyses. All treatment systems should be installed and maintained in accordance with equipment manufacturer's instructions.
- 13 Boiling water or using disinfectant tablets to deactivate pathogens prior to consuming or using water is a practical alternative in remote locations. Boiling, however, does not remove harmful chemicals or detoxify algae.

General household water supplies

- 14 Untreated water can be suitable for toilet flushing and garden watering provided it meets aesthetic and salinity quality criteria. Caution is needed where untreated water supplied to the bathroom or laundry may come into contact with or be consumed by children.
- 15 Approval from local health authorities should be sought for all in-house plumbing, as pipe-work cross connections sometimes occur, which could result in unsafe water reaching the kitchen tap.
- 16 Warning signs should be placed near taps supplying water that is possibly unsafe for drinking or food preparation. In some settings calcium-rich (hard) or corrosive waters may damage plumbing fittings, and iron or manganese could stain clothing. Seek advice on the properties of local water in your area from local government.

Water quality testing

- 17 Private water supplies should be sampled, scientifically tested and checked against published national water quality guideline criteria (see *Water quality criteria* section) as 'fit for purpose' prior to use. If doubts exist about your local water quality or the effects of any nearby land use, representative samples of the water should be tested at a laboratory accredited by the National Association of Testing Authorities.
- 18 A water analysis program should be developed that includes water sampling undertaken by people qualified and experienced in water quality testing. Confirmation should be sought from the Department of Health or local government on acceptability of testing regimes.
- 19 As water quality may vary seasonally or over time, regular analyses should occur, timed to capture high-risk events associated with the use of a tainted water source. For

example, for surface water sources, the highest contamination risk normally arises after heavy rainfall, especially at the onset of the wet season and after wildfires.

- 20 Comprehensive and accurate water quality analysis requires skilful management, appropriate sample collection and preservation (such as samples held on ice and analysed within 24 hours of collection) and can be costly. The costs of water analysis are normally met by the water user, although guidance may be obtained from relevant government agencies such as ChemCentre (see Appendix A).
- 21 Water test kits designed for field use can provide an indication of water contamination for many substances, provided the supplier's recommendations are closely followed.
- 22 Where field testing indicates the water quality is marginal or uncertain for the intended use, NATA accredited laboratory testing should follow, particularly if human health may be at risk.
- 23 For human drinking water supplies, water testing is recommended as follows:

Table 1 – Testing of private drinking water supplies

Description	Characteristics	Measured parameter	Minimum frequency
Raw water	Physical	pH, colour, alkalinity, EC, turbidity, algae	Fortnightly
	Chemical	Pesticides	Monthly
		Selected metals	Quarterly
	Microbiological	Thermotolerant coliforms or <i>E.coli</i>	Monthly
Radiological	Gross Alpha and Beta activity	Every five years	
Treated water	Physical	pH, dissolved oxygen, turbidity, hardness, temperature, algae	Daily
	Chemical	Disinfectant residual	Weekly
		Selected metals, salts	Quarterly
Microbiological	Thermotolerant coliforms or <i>E. coli</i>	Monthly	

Source: *Australian drinking water guidelines* and Department of Health (WA)

Table 1 explanatory notes:

- a Where the water source is poorly protected from contamination risks or water use changes seasonally, such as for holiday accommodation, an increased frequency for analyses may be warranted.
- b Where untreated drinking water has not been shown to be free of microbiological contamination, it should be boiled prior to any human consumption.

How do you know if your water supply may cause harm?

- 24 Some water quality indicators may be evident to our senses, such as colour, odour, sediment and taste. However, there are chemical and microbiological contaminants in water that cannot be readily be seen, smelt or tasted. This is why it is important to have your water quality tested regularly.
- 25 Some insight into potential water contamination risks may be gained by having a good understanding of surrounding land uses, what chemicals may be in use and whether

neighbours have experienced problems with their water supplies. In general, the more intensive the land use, the greater the risks of water sources being contaminated.

- 26 To be confident that a water supply is safe, it should be isolated from contamination hazards or subject to continuous water treatment and regular laboratory testing. Public water supply agencies routinely test and treat water before supply to the community. Comprehensive treatment and testing is rarely within the technical or financial capabilities of individuals.
- 27 Laboratory data should be compared against national water quality guideline criteria (see *Water quality criteria*) to check if the water source is suitable for the intended use. These criteria vary depending on what the water is used for. There are separate tables and guidance statements available to cover the following water uses:
- a human drinking water
 - b livestock water supplies
 - c irrigation of plants
 - d recreation or bathing contact
 - e ecosystem support, such as the natural environment or aquaculture ponds
 - f industrial materials processing
 - g aesthetic needs, such as in ornamental pools or flushing of toilets.

Water quality criteria

- 28 Detailed guidance on water quality is given in the following *National water quality management strategy* documents, which are available via library services or online (reference 1):
- a *Australian drinking water guidelines* (2011)
 - b *Australian and New Zealand guidelines for fresh and marine water quality* (2000)
 - c *Australian guidelines for water quality monitoring and reporting* (2000).
- 29 Supporting information on water quality is also available:
- a Australian Standard 5667, *Water quality sampling* (reference 11)
 - b American Public Health Association, American Water Works Association, Water Environment Federation, *Standard Methods for the examination of water and wastewater* (reference 12b)
 - c The Department of Water's *Hydrogeological data atlas* (reference 7b).

What can be done to protect private water sources?

Water should be drawn from a site away from areas of potential contamination.

- 30 Groundwater sources should have a 100 m buffer (where possible) upstream of potential contamination sources. This includes sewage systems (such as septic tank and leach drain systems), fuel and chemical storage, waste dumps, animal holding areas, irrigated crops, workshops and mechanical equipment servicing areas.
- 31 For non-potable surface water sources such as soaks, dams and waterways, maintain a fenced native vegetation buffer of at least 30 m from potential contamination sources.

- 32 Vegetation buffers assist in filtering stormwater runoff prior to its entry into surface water sources. For more information, see our Water quality protection note (WQPN) 6 *Vegetated buffers to sensitive water resources* (reference 7a).
- 33 The Department of Environment Regulation maintains a contaminated sites database, available <www.der.wa.gov.au>. Do not draw drinking water from a potentially contaminated site.

Use best practice construction techniques for bores

- 34 Bore construction should follow the recommendations given in *Minimum construction requirements for water bores in Australia* (reference 10). It is particularly important to place a cement seal around the top of bore casings to prevent entry of any contaminated surface water and ensure the bore head is located above any flood level. Used a licensed contractor to install bores.

Avoid applying or disposing of industrial chemicals near any water source

- 35 Cleaning and servicing of vehicles, and dumping of wastes such as paints, oils or solvents in sensitive areas can result in residues moving through the soil causing water contamination. Rainfall or stormwater runoff may also wash contaminants from the soil surface into the resources from where water is drawn. It is good practice to carefully follow chemical labels and use chemicals away from waterways, wetlands and land subject to flooding. Bypass drains should be used to divert contaminated stormwater runoff away from water supply sources.

Apply garden and agricultural chemicals sparingly and carefully

- 36 Fertiliser and pesticides should be applied in accordance with: material safety data sheets, supplier's recommendations on chemical containers (following advice on buffers to water sources) and following a *Nutrient and irrigation management plan* (reference 7a). Excessive or poorly timed use of horticultural chemicals (such as during wet weather) can harm water resources.

Use best practice stormwater management

- 37 Rainwater which is not captured in tanks for domestic use can be protected via appropriate best practice stormwater management. Water from small to moderate rainfall events should be allowed to soak immediately into porous soils. This reduces the risk of drainage waters contaminating aquifers. Potentially contaminated stormwater, typically from paved areas where chemical residues or animal wastes may be present, should not discharge directly into surface water bodies, except during major storm events. For additional information on stormwater management, see our *Stormwater management manual for Western Australia* (reference 7d).

Avoid disturbing or draining wetlands

- 38 Wetland soils are often a reservoir of acid-sulfide rich matter. Any disturbance (such as lowering of water tables or saturated acid sulphate soil exposure to air) can release sulfuric acid into groundwater. Acidic groundwater can mobilise metals in the environment with potential hazardous health effects. In severe disturbance cases, groundwater can become too acidic for farm water supplies or irrigation use. For more information contact the Department of Environment Regulation's contaminated sites section <www.der.wa.gov.au>.

Recycle waste materials

39 Metals, waste chemicals, used oil, tyres, batteries, and contaminated containers and packaging should be held in a weatherproof container prior to disposal at approved facilities. Your local government can advise on nearby waste handling sites.

Store water supplies for an extended period in a tank or dam before use

40 Extended storage allows sediment to settle. Open storage allows ultraviolet light and oxygen to assist natural disinfection processes. Water storage also dilutes chemical residues from spills or contamination incidents. However, algae may be a problem if the water contains excessive nutrients.

Clean up any spilt chemicals

41 Chemical spill cleanup should be undertaken immediately using absorbent litter or by removing contaminated soil. The waste material should be placed in a skip for disposal at a secure landfill. Urgent remedial action lessens the risk of contaminants spreading into the surrounding environment and causing harm. Chemical residues should not be hosed into the soil or flushed into drainage systems.

Join or form a local catchment group

42 This fosters community understanding, and provides an issues and advocacy forum for local water resource protection needs.

What are the options if my water source is contaminated?

Stop using any water source where human health is at risk

43 For kitchen use and drinking, water should be drawn from an alternative local source, carted from a safe water source, collected from roof tops into storage tanks or commercial bottled water supplies. **Drinking untreated surface water and groundwater may be harmful to human health.**

44 Where drinking water may be contaminated by microorganisms, boiling the water or using water purification tablets before use may be effective. If in doubt, seek advice from your local government's environmental health section.

Attempt to determine the cause of any water source contamination

45 Contamination may arise from a single source, such as an industrial chemical spill, or diffuse sources from the inappropriate use of agricultural chemicals within the water catchment. Where severe water contamination may be present, seek expert assistance.

46 Some guidance may be available from your local government's environmental health section, local catchment management group or state agencies such as the Department of Agriculture and Food, Department of Environment Regulation, Department of Health, Department of Water or the Department of Fire and Emergency Services.

Discuss your water quality issue with those operating the contamination source

47 If the source of water contamination is obvious, local government can advise on whether the problem is linked to an approved land use or activity. If the activity is legal, you should initially contact the landholder believed to have caused the contamination (if practical), discuss your concerns and determine if the landholder is prepared to take

corrective action. If neighbours are suffering similar problems to yourself, consider forming an action group and appoint a negotiator. It is wise to document the harm being caused, discuss practical means that may lessen contamination, and propose measures that will be of benefit to all parties.

- 48 If the activity appears to be illegal (such as waste dumping), contact your local government initially for advice. The health or planning officer may help resolve the matter. Otherwise you may seek intervention via community representatives, relevant regulatory agencies such as the Department of Environment Regulation or Keep Australia Beautiful Council, or as a last resort, seek legal advice.

Treat the water to remove contaminants

- 49 This is an issue requiring professional skills and experience. Suitable treatment may involve filters, biological stabilisation and settling, chemical dosing, aeration and disinfection or even advanced treatments such as reverse osmosis or ion exchange. Selection of a suitable treatment system requires extensive research or advice from water treatment experts. Such systems require regular ongoing monitoring for optimum performance and effectiveness.
- 50 Ongoing efficient water treatment (apart from filtration and disinfection) is normally beyond the practical capability of most water users, hence treatment is normally restricted to water agencies and commercial firms employing specialist personnel. Where pool chlorine (hypochlorite) is used to eliminate bacteria and viruses, a minimum free chlorine residual of 0.5 parts per million should be present 30 minutes in the water after treatment. This may be tested using a chemical additive and water colour comparison chart.
- 51 An excessive chlorine residual (above 2 parts per million) will make water unpalatable and possibly harmful, especially if it reacts with organic residues in the water. Photometric testing is considered best practice for accurately determining chlorine residuals.

What can be done if my water source becomes contaminated?

In Western Australia, there is presently limited support available to people whose private water sources have become contaminated. To achieve a detailed understanding of the quality of all water sources across the state would require an enormous commitment to water sampling and analysis.

This would not provide a guarantee that untreated water taken from the environment would be continuously safe for various uses. Funding such a scheme (such as via increased taxes) rarely finds favour in the community when there are viable cost-effective alternatives.

- 52 Pollution of waters should be reported to the Department of Environment Regulation. There are laws against deliberate and accidental pollution, and officers may be able to take action to stop a point source of contamination. Significant contamination issues include illegal dumping, poor chemical management or leakage from chemical storage facilities.
- 53 Despite court action being successful, contaminants may still remain in the environment long after the source is removed and may continue to present problems to

water supplies. The *Environmental Protection Act 1986* presently has limited provisions to direct and supervise clean-up of contaminated waters.

- 54 For advice on the classification and clean-up of contaminated sites contact the Department of Environment Regulation. Section 130/1 *Riparian rights* under the *Health Act 1911* may be used by local government to control pollution within surface water systems. State agencies may assist via guidance and mediation to resolve disputes (within constraints imposed by their responsibilities, priorities and available resources).
- 55 Apart from seeking action by the Department of Environment Regulation, people with polluted water sources could seek remedies via civil action in the courts.
- 56 Water source owners with suspect quality will (using expert assistance) need to:
- a establish what contaminants are present and their concentration (via water sampling and analysis)
 - b demonstrate the path between their water supply problem and any neighbouring pollutant source
 - c arrange for an expert study to describe how water moves in the environment
 - d make an accurate record of the observed actions of the landholder causing the problem.

This may be difficult if the contamination source is widespread or occasional e.g. agricultural chemicals applied on a number of sites.

- 57 When contamination arises from multiple sources such as salinity or excess nutrients in a catchment, it is probably best to join (or start) a local community action group. Groups of people with similar problems or concerns may use their combined knowledge, resources and influence to secure an acceptable outcome.
- 58 Pipework and water outlets that supply water that doesn't meet drinking water quality guidelines should be colour coded purple in accordance with Australian standard AS2700 and warning signs stating *Unsafe water, do not drink* or an explanatory image prominently displayed. Installation should conform to Australian Standard AS3500.

Where can I get information on how to protect water resources from contamination?

- 59 The Department of Water is progressively preparing community information advice such as brochures and water quality protection notes. These cover land uses and activities that are common in catchments where water supplies are drawn, and activities that may cause harm to waters if poorly managed. These notes (reference 7a) are available online or by contacting our local office. We also prepare environmental guidelines and codes of practice in partnership with other resource management agencies and industrial activity associations. Copies of brochures, codes, guidelines, notes and information sheets are available online from <www.water.wa.gov.au> select *publications > find a publication > series browse >* or contact our local office.

Appendix A: Useful contacts

- ChemCentre (water chemistry), www.chemcentre.wa.gov.au
- Local government community health
- Department of Health (WA), Public Health, www.health.wa.gov.au

- Pathwest (analysis of microbes in water), www.pathwest.com.au
- Poisons Information Centre, phone 13 1126
- Water Corporation, www.watercorporation.com.au

Appendix B: Statutory approvals relevant to this note include:

What is regulated?	Western Australian statutes	Regulatory agency
Licensing, works approvals and registration of prescribed premises; pollution abatement	<i>Environmental Protection Act 1986</i> - Part V Environmental Regulation - Part VI Enforcement	Department of Environment Regulation < www.der.wa.gov.au >
Safety of community water supplies	<i>Health Act 1911</i>	Department of Health, Environmental health branch < www.health.wa.gov.au > Local government
Licence to use water from proclaimed areas and all artesian bores	<i>Rights in Water and Irrigation Act 1914</i>	Department of Water, regional office < www.water.wa.gov.au >
Development and operations in public drinking water source areas	<i>Metropolitan Water Supply, Sewerage and Drainage Act 1909</i> <i>Country Areas Water Supply Act 1947</i>	
Development approval for land use activities	<i>Planning and Development Act 2006</i>	Local government
Impact on the values and ecology of the environment including waters	<i>Environmental Protection Act 1986</i> - Part III Environmental Protection Policies - Part IV Environmental Impact Assessment	Minister for the Environment advised by the Office of the Environmental Protection Authority < www.epa.wa.gov.au >

Relevant statutes are available from the State Law Publisher at <www.slp.wa.gov.au>.

References and further reading

- 1 Australian Government - National water quality management strategy papers, available online at <www.environment.gov.au> select *water* > *water policy and programs* > *water quality*
 - a *Paper 4 Australian and New Zealand guidelines for fresh and marine water quality*, 2000
 - b *Paper 6 Australian drinking water guidelines*, 2011
 - c *Paper 7 Australian guidelines for water quality monitoring and reporting*, 2000.
- 2 Australian Bureau of Meteorology climate data (average rainfall, pan evaporation) for Western Australia available online at <www.bom.gov.au/climate/averages/>.
- 3 Department of Agriculture and Food (WA) farm note series available online at <www.agric.wa.gov.au>:

- no. 42/2004 *Clearing cloudy or discoloured water*
 - no. 43/2004 *Water quality for farm domestic and livestock use*
 - no. 44/2004 *Emergency chlorination of farm water.*
- 4 Department of Environment Regulation publication available <www.der.wa.gov.au> *Contaminated sites regulation.*
 - 5 Department of Health (NSW) publication available online at <www.health.nsw.gov.au> *Private water supply guidelines.*
 - 6 Department of Health (WA) publications available online at <www.health.wa.gov.au> select *Food safety* or *Water safety*
 - a *Australian food standards code*
 - b *Guidance on use of rainwater tanks*
 - c *Monitoring drinking water*
 - d *Nitrate in drinking water*
 - e *Standard water sampling techniques*
 - f *Using bore water safely*
 - g *Water filters.*
 - 7 Department of Water (WA) publications available online at <www.water.wa.gov.au>
 - a Water quality protection notes (WQPN), select *publications* > *find a publication* > *series browse* > *water quality protection notes*:
 - WQPN 02 *Aquaculture*
 - WQPN 06 *Vegetation buffers to sensitive water resources*
 - WQPN 09 *Community drinking water sources*
 - WQPN 33 *Nutrient and irrigation management plans*
 - WQPN 39 *Ponds for stabilising organic matter*
 - WQPN 48 *Water supplies for rural lots (non-potable use)*
 - WQPN 68 *Mechanical equipment wash down.*
 - b *Perth groundwater atlas* or *Hydrogeological atlas*; select *Tools and data* > *Maps and atlases.*
 - c Water notes (WN); select *publications* > *find a publication* > *series browse*
 - WN 04 *Wetland buffers*
 - WN18 *Livestock management – fence location and grazing control*
 - WN 23 *Determining foreshore reserves*
 - d *Stormwater management manual for Western Australia 2004*; select *managing our water* > *stormwater and drainage*
 - 8 Engineers Australia publication available for purchase at <www.engineersmedia.com.au> search *EA books* *Australian rainfall and runoff* (current edition).

- 9 enHealth Council publication available online at
<https://www.health.gov.au/internet/main/publishing.nsf/Content/health-publth-publicat-document-metadata-env_rainwater.htm>
Guidance on the use of rainwater tanks, 2004.
- 10 National Uniform Drillers Licensing Committee, publication available online at
<<http://adia.com.au/wp-content/pdf/MCR3RD2012B.pdf>>
Minimum construction requirements for water bores in Australia, 2012.
- 11 Standards Australia publications available for purchase at <www.saiglobal.com> select
publications
- a AS/NZ 5667 *Water quality sampling*
 - a AS 2070 *Plastic materials for food contact use*
 - b AS2700 *Colour standards for general purposes*
 - c AS/NZ 3500 *Plumbing and drainage-water services*
 - d AS/NZ 4348 *Domestic type water treatment appliances-performance requirements.*
- 12 Standards from the United States of America:
- a ANSI/NSF Standard 53 *Drinking water treatment units-health effects*, see web page
<www.nsf.org>
 - b American Public Health Association, American Waterworks Association, Water Environment Federation (APHA, AWWA, WEF) *Standard methods for the examination of water and wastewater* <www.standardmethods.org>.

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Feedback

We welcome your thoughts on this note. Feedback will help us prepare future versions.

To comment on this note or seek any clarification, please contact our water source protection planning branch (details below), citing the note topic and version.

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