



Government of Western Australia
Department of Water

Seabird Water Reserve

Drinking water source protection review

Seabird town water supply



Looking after all our water needs

Water resource protection series
Report WRP 120
April 2011

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Summary

This drinking water source protection review considers changes and implementation issues that have occurred in and around the Seabird Water Reserve since the completion of the *Seabird Water Reserve water source protection plan* (Water and Rivers Commission 1997). Where changes have occurred, this review recommends new management strategies that may be required. This review should be read in conjunction with the 1997 plan. Both of these documents are available on our website or by contacting us (see details on the inside cover of this report).

Seabird is a small fishing and holiday town located on the Western Australian coast about 100 km north of Perth, in the Shire of Gingin. Drinking water is supplied to the town by the Water Corporation from two bores (1/75 and 1/83) which draw water from a confined aquifer. The bores are located in a secure compound owned by the Water Corporation (see Figure 1), and are constructed and sealed adequately to protect the confined aquifer from contamination.

The confined nature of the aquifer means that there is negligible risk from contamination that may occur at the surface. The water quality in the Seabird bores is generally good, only requiring treatment for the removal of naturally occurring iron, and standard disinfection that occurs for most drinking water sources.

Only one recommendation from the 1997 plan remains outstanding; to include the Seabird Water Reserve as a special control area in the Shire of Gingin's local planning scheme. This has been carried forward as a new recommendation in this review. This review also recommends that the Seabird Water Reserve is reduced in size to the Water Corporation-owned lot, given the confined nature of this source. This source will continue to provide Seabird's drinking-water needs into the foreseeable future.

The following table shows important information about the Seabird Water Reserve.

Key information about the Seabird Water Reserve

Seabird Water Reserve	
Local government authority	Shire of Gingin
Locations supplied	Seabird
Aquifer type	Confined
Volume of water abstracted	38 830 kL/year (based on 2009/10 data) Licensed to take 100,000 kL/year
Bore number and GPS coordinates	1/75 (352385 E, 6538780 N) 1/83 (352403 E, 6538788 N)

Date of bore completion	1/75 – 1975 1/83 – 1983
Bore screening	1/75 – screened between 92.7 m and 103.9 m deep 1/83 – screened between 96 m and 102.4 m deep
Date of drinking water source protection document	1997 – drinking water source protection plan 2011 – drinking water source protection review, includes an audit of the implementation of recommendations in the 1997 plan
Proclamation status	<ul style="list-style-type: none"> • Proclaimed in 1971 under the <i>Country Areas Water Supply Act 1947</i> (WA). • Boundary amended in 1999 to include wellhead protection zone, as recommended in the 1997 plan. • Boundary recommended to be reduced in size to reflect confined nature of source, as per this 2011 review.

1 Review of the Seabird drinking water source protection plan

1.1 Water reserve boundary, priority areas and protection zones

The existing Seabird Water Reserve boundary was amended in 1999 under the *Country Areas Water Supply Act 1947*. The boundary included a Priority 3 (P3), 300 m wellhead protection zone (WHPZ) (see the *Seabird Water Reserve water source protection plan*, Water and Rivers Commission (WRC) 1997).

Since the 1997 publication of the *Seabird Water Reserve water source protection plan*, the Department of Water's policy about how we protect drinking water sources has changed. Drinking water sources that are supplied from a confined aquifer, such as this one, now only require a water reserve boundary that reflects the compound or lot in which the drinking water bores are located. This reduced boundary still ensures that the location of this important water supply will be proclaimed and mapped. A larger boundary is not deemed necessary because the source is adequately protected from surface contamination risks by a confining layer of rock about 10 m thick and over 25 m deep (Lancelin and Osborne formations).

Figure 1 shows the new reduced boundary, comprising of Lot 9916, owned by the Water Corporation. The Department of Water will arrange proclamation of the new Seabird Water Reserve boundary under the *Country Areas Water Supply Act 1947* as recommended in section 2.2. At the same time we will remove the WHPZ and change the priority area from P3 to Priority 1 (P1) to reflect the importance of this redefined area.

The boundary, priority area and protection zone changes have been determined in accordance with current departmental policy and in consultation with affected stakeholders.

If you require more information on the protection of public drinking water source areas (PDWSAs), please refer to our Water quality protection note (WQPN) no.36: *Protecting public drinking water source areas*.

1.2 Update on water supply scheme

The Seabird bore field still consists of two bores (1/75 and 1/83), which draw water from the Leederville (confined) aquifer. They are adequately constructed and sealed so that the possibility of surface contamination is negligible. Further information about the aquifer if available in the *Seabird Water Reserve water source protection plan* (WRC 1997). Groundwater from this source undergoes aeration and filtration to remove iron and manganese, and stabilise pH. Chlorination is carried out to disinfect the water, to ensure appropriate microbiological quality for consumers. It is then pumped into the storage tank and distributed via gravity to the town scheme. The Water Corporation upgraded Seabird's water quality treatment system during 2010.

The Water Corporation's groundwater allocation licence has recently been renewed. The licence allows the Corporation to draw 100 000 kL per year of water from the Leederville aquifer to supply Seabird's drinking water from two bores. This licence expires in 2020. 38 830 kL was extracted during the 2009-2010 financial year.

1.3 Native title claims

Native title is the recognition in Australian law that some Aboriginal people continue to hold Native title rights to lands and water arising from their traditional laws and customs. There are two native title claims covering the Seabird Water Reserve. These are the Yued claim (WAD 6192/98) and the Single Noongar Claim (Area 1) (WAD 6006/03), both represented by the South West Aboriginal Land and Sea Council.

The Department of Water is committed to working with Aboriginal people in its planning and management activities. The department recognises that Native title provides an important framework for water management.

1.4 Update on water quality risks

As part of this review we conducted an assessment of water quality contamination risks to the Seabird drinking water source, in accordance with the *Australian drinking water guidelines* (ADWG) (NHMRC & NRMCC 2004). As Seabird's drinking water is drawn from a confined groundwater source, there is negligible potential for contamination from surrounding land uses. This is because a confining layer of rock sits above the groundwater resource, acting as a barrier to contamination.

The Seabird townsite, mostly residential, is located to the west of the bores, with the closest residence approximately 150 m away. The majority of land surrounding the bores is native coastal scrub. There are several undeveloped lots to the north-west of the bores, and the remaining area is within a crown lease (see Figures 1 and 2).

The two public drinking water supply bores are in a secure compound that is owned by the Water Corporation. There has been no evidence of vandalism.

The aquifer recharge area is located approximately 30 km to the east of Seabird, and groundwater flows in a westerly direction. This area is still rural-zoned land. Given the low intensity of the land use and the distance and extended time required for groundwater to travel to the bores, the likelihood of contamination from the recharge area is considered to be rare.

Bores drilled near a public drinking water supply bore (e.g. for irrigation or private purposes) can cause contamination of the drinking water source. For example, a poorly constructed bore may introduce contaminants from surface leakage down the outside of the bore casing into an otherwise uncontaminated aquifer.

It is therefore important to ensure that any bores are appropriately located and constructed to prevent contamination of the town's water supply. The Seabird Water Reserve is within the SA2 subarea of the Gingin Groundwater Area. Therefore,

licence applications for new bores are required and will be assessed through the Department of Water's water licensing process (where applicable) under the *Rights in Water and Irrigation Act 1914*. All bores should be constructed in accordance with *Minimum construction requirements for water bores in Australia* (National Minimum Bore Specifications Committee 2003).

The Department of Water will investigate with the Department of Regional Development and Lands the possibility of reflecting the requirement to appropriately construct bores in lease conditions for the affected crown lease when it is due for renewal (approximately 2015).

1.5 Water quality information

The Water Corporation have provided updated water quality information for the Seabird bore field. This is shown in Appendix B. There is a high level of naturally occurring iron in the water, which is treated. The water is also disinfected by chlorination before supplying to consumers.

2 Implementation of the Seabird drinking water source protection plan

2.1 Status of previous recommendations

Six out of seven recommendations from the 1997 plan were completed. This table outlines recommendations from the 1997 plan and their current status.

Recommendation 2 will be carried forward to the recommendations section of this review, along with those that require ongoing implementation work.

Table 1 Status of recommendations from the 1997 Seabird Water Reserve water source protection plan

No.	1997 plan recommendation (responsible authority in brackets)	Status	Comments
1	Gazettal of water reserve (WRC).	Completed	Gazetted in 1999 under the <i>Country Areas Water Supply Act 1947</i> .
2	Incorporation into land planning strategies (Shire of Gingin).	Incomplete	The water reserve was not incorporated into the Gingin local planning scheme. <i>This recommendation should be carried forward.</i>
3	<ul style="list-style-type: none"> Provide the Shire of Gingin with guidelines for referral of development proposals (WRC). Referral of development proposals (Shire of Gingin). 	Completed	Guidelines have been provided through our water quality protection note series. Development proposals within PDWSA are referred to our Swan-Avon region office.
4	Erection of signs (WRC): <ul style="list-style-type: none"> Development of guidelines for signage. Determine number and location of signs required. Erect signs. 	Completed	The Water Corporation developed Corporate standard <i>S111 Source protection signage</i> . Water Corporation signs are displayed on the bore compound and drinking water treatment plant. As the water reserve is reducing in size, additional signs are not required.
5	Emergency response (WRC): <ul style="list-style-type: none"> Develop response plan. Inform WAHMEMS personnel of special requirements for the Seabird Water Reserve. 	Completed	Emergency response protocols have now changed to the jurisdiction of the local emergency management committee, managed by the Shire of Gingin.

No.	1997 plan recommendation (responsible authority in brackets)	Status	Comments
6	Surveillance program (WRC): <ul style="list-style-type: none"> Develop guidelines for the surveillance of water reserves. Implement the surveillance program. 	Completed	Water Corporation undertakes surveillance in the water reserve and its surrounds.
7	Review of the plan and recommendations (WRC).	Completed	Undertaken through the preparation of this review document (2011).

2.2 Consolidated recommendations

Based on the findings of this review, the following recommendations will now be applied to the Seabird Water Reserve. The bracketed stakeholders are those expected to have a responsibility for, or an interest in, the relevant recommendation being implemented.

- 1 Reduce the boundary of the Seabird Water Reserve under the *Country Areas Water Supply Act 1947*. (Department of Water)
- 2 Develop an implementation strategy for this plan's recommendations showing responsible stakeholders and planned timeframes. (Department of Water with applicable stakeholders)
- 3 Incorporate this plan and reflect the updated Seabird Water Reserve boundary, and its P1 area in the *Shire of Gingin local planning scheme* in accordance with the Western Australian Planning Commission's Statement of planning policy no.2.7: *Public drinking water source policy*. (Shire of Gingin)
- 4 Incidents covered by Western Australian Plan for Hazardous Materials the Seabird Water Reserve should be addressed by ensuring that:
 - the Shire of Gingin's local emergency management committee is aware of the location and purpose of the Seabird Water Reserve
 - the locality plan for the Seabird Water Reserve is provided to the fire and emergency services headquarters for the HAZMAT emergency advisory team
 - the Water Corporation acts in an advisory role during incidents in the Seabird Water Reserve
 - personnel dealing with WESTPLAN–HAZMAT incidents in the area have ready access to a locality map of the Seabird Water Reserve and information to help them recognise the potential impacts of spills on drinking water quality. (Water Corporation)
- 5 Assess the location and construction of private bores surrounding the Seabird Water Reserve through the water licensing process where applicable under the *Rights in Water and Irrigation Act 1914*. (Department of Water)

- 6 Investigate with the Department of Regional Development and Lands the possibility of reflecting bore construction requirements in lease conditions for the affected crown lease when it is due for renewal (approximately 2015). (Department of Water)
- 7 Maintain the fencing and signage on the bore compound for continued protection from immediate contamination threats. (Water Corporation)
- 8 Review this plan after five years. (Department of Water)

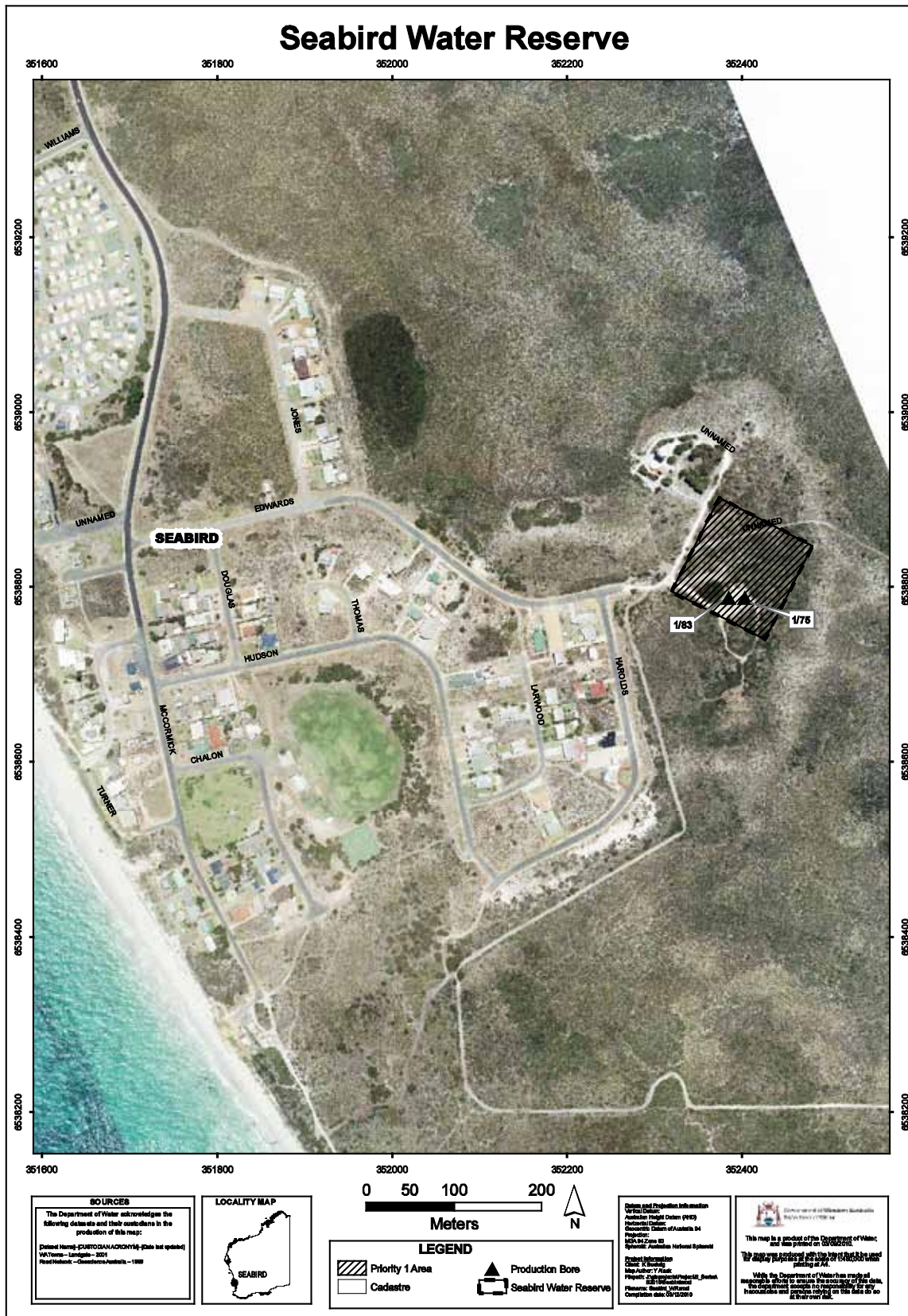


Figure 2 – Seabird Water Reserve aerial photo showing land uses

Appendix B – Water quality data

This information in this Appendix has been supplied by the Water Corporation.

The Water Corporation has monitored the raw (source) water quality from Seabird bore field in accordance with the Australian drinking water guidelines (ADWG) and interpretations agreed to with the Department of Health. The raw water is regularly monitored for aesthetic-related characteristics (non-health related), and health-related characteristics (health-related chemicals and microbiological contaminants).

The following data is representative of the quality of raw water from Seabird bore field. In the absence of specific guidelines for raw water quality, the results have been compared with the ADWG values set for drinking water, which defines the quality requirements at the customers tap. Results that exceed the ADWG have been shaded to give an indication of potential raw water quality issues associated with this source.

It is important to appreciate that the raw water data presented does not represent the quality of drinking water distributed to the public. Barriers such as storage and water treatment, to name a few, exist downstream of the raw water to ensure it meets the requirements of the ADWG. For more information on the quality of drinking water supplied to Seabird, refer to the most recent Water Corporation drinking water quality annual report at www.watercorporation.com.au/W/waterquality_annualreport.cfm

Aesthetic-related characteristics

Aesthetic water quality analyses for raw water from the Seabird bore field are summarised in the table below.

The values are taken from ongoing monitoring for the period November 2005 to October 2010. All values are in milligrams per litre (mg/L) unless stated otherwise. Any water quality parameters that have been detected are reported, those that have on occasion exceeded the ADWG are shaded.

Aeration and filtration is in place for iron and manganese removal and subsequent turbidity reduction.

Health-related characteristics

Health-related chemicals

Raw water from the Seabird bore field is analysed for health related chemicals including inorganics and pesticides. Health related water quality parameters that have been measured at detectable levels in the source between November 2005 to October 2010 are summarised in the table below. No parameters exceeded the ADWG health guideline values.

Aesthetic-related detections for the Seabird bore field

Parameter	Units	ADWG aesthetic guideline value*	Seabird bore field raw water	
			Range	Median
Chloride	mg/L	250	195 - 215	200
Colour – true	TCU	15	<1 - 17	<1
Hardness as CaCO ₃	mg/L	200	90 - 95	93
Iron unfiltered	mg/L	0.3	0.2 - 7	2.6
Sodium	mg/L	180	125 - 135	130
Total filterable solids by summation	mg/L	500	519 - 548	532
Turbidity	NTU	5	1.7 - 65	19
pH measured in laboratory	NO UNIT	6.5 – 8.5	6.68 – 7.08	6.89

* An aesthetic guideline value is the concentration or measure of a water quality characteristic that is associated with good quality water.

Health-related detections for the Seabird bore field

Parameter	Units	ADWG health guideline value*	Seabird bore field raw water	
			Range	Median
Nitrate as nitrogen	mg/L	11.29	<0.002 – 0.008	0.013
Nitrite as nitrogen	mg/L	0.91	<0.002 – 0.006	<0.002
Nitrite plus nitrate as N	mg/L	11.29	<0.05 – 0.06	<0.0345
Manganese unfiltered	mg/L	0.5	0.004 – 0.24	0.065
Sulphate	mg/L	500	33 - 34	34
Fluoride laboratory measurement	mg/L	1.5	0.25 – 0.3	0.25

* A health guideline value is the concentration or measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption (NHRMC & NRMCC 2004).

Microbiological contaminants

Microbiological testing of raw water samples from the Seabird bore field is currently conducted on a monthly basis. *Escherichia coli* counts are used as an indicator of the degree of recent faecal contamination of the raw water.

A detection of *Escherichia coli* in raw water abstracted from any bore may indicate contamination of faecal material through ingress into the bore, or recharge through to the aquifer.

During the review period of November 2005 to October 2010, positive *Escherichia coli* counts were not detected in any samples demonstrating the protection offered by the confined nature of the aquifer.

Appendix C – How do we protect public drinking water source areas?

The *Australian drinking water guidelines* (ADWG) (NHMRC & NRMCC 2004) outline how we should protect drinking water in Australia. The ADWG recommends a ‘catchment to consumer’ framework that uses a preventive risk-based and multiple-barrier approach. A similar approach is recommended by the World Health Organization.

The ‘catchment to consumer’ framework applies across the entire drinking water supply system – from the water source to your tap. It ensures a holistic assessment of water quality risks and solutions to ensure the delivery of a reliable and safe drinking water to your home.

A preventive risk-based approach means that we look at all the different risks to water quality, in order to determine what risks can reasonably be avoided and what risks need to be minimised or managed. This approach means that the inherent risks to water quality are as low as possible. A multiple-barrier approach means that we use different barriers against contamination at different stages of a drinking water supply system.

The first and most important barrier is protecting the catchment. If we get this barrier right, it has a ‘flow-on effect’ that can result in a lower cost, safer drinking water supply. Other barriers against contamination include storage of water to help reduce contaminant levels, disinfecting the water (e.g. chlorination to inactivate pathogens), maintenance of pipes and testing of water quality. Another community benefit of catchment protection is its complimentary nature to conservation initiatives.

Research and experience shows that a combination of catchment protection and water treatment is safer than relying on either barrier on its own. That’s why this drinking water source protection review is important. We should not forget that ultimately it’s about protecting your health, and about protecting the catchment’s water quality now and for the future.

In Western Australia, the Department of Water protects public drinking water source areas (PDWSAs) by putting the ADWG into practice, writing plans, policies and guidelines, and providing input into land-use planning.

The *Metropolitan Water Supply, Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947* provide us with the tools we need to protect water quality in PDWSAs. These tools allow us to assess and manage the water quality contamination risks from different land uses and activities. We work cooperatively with other agencies in the implementation of this legislation.

An important step in maximising the protection of water quality in PDWSAs is to define priority areas and protection zones to help guide land use planning and to identify where legislation applies. There are three different priority areas. Priority 1 (P1) areas are defined and managed to ensure there is no degradation of the quality of the drinking water source using the principle of risk avoidance. Priority 2 (P2)

areas are defined and managed to maintain or improve the quality of the drinking water source using the principle of risk minimisation. Priority 3 (P3) areas are defined and managed to maintain the quality of the drinking water source for as long as possible using the principle of risk management. Protection zones surround drinking water extraction points (such as bores and reservoirs), so that the most vulnerable areas may be protected from contamination.

If you would like more information about the ADWG and how we protect drinking water in Western Australia, go to <<http://drinkingwater.water.wa.gov.au>> or email drinkingwater@water.wa.gov.au.

List of shortened forms

ADWG	<i>Australian drinking water guidelines</i>
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
DWSPP	drinking water source protection plan
FESA	Fire and Emergency Services Authority
HAZMAT	hazardous materials
kL	kilolitre
km	kilometre
LEMC	local emergency management committee
m	metres
mg/L	milligram per litre
NHMRC	National Health and Medical Research Council
NRMMC	Natural Resource Management Ministerial Council
NTU	nephelometric turbidity units
PDWSA	public drinking water source area
P1	priority 1
P3	priority 3
TCU	true colour units
WAHMEMS	Western Australian Hazardous Materials Emergency Management Scheme
WAPC	Western Australian Planning Commission
WESTPLAN–HAZMAT	Western Australian plan for hazardous materials
WHPZ	wellhead protection zone
WQPN	water quality protection note
WRC	Water and Rivers Commission

Glossary

Aesthetic guideline value	The concentration or measure of a water quality characteristic that is associated with acceptability of water to the consumer, e.g. appearance, taste and odour (NHMRC & NRMMC 2004).
Allocation	The quantity of water that a licensee is permitted to abstract is their allocation, usually specified in kilolitres per annum (kL/a).
Aquifer	An aquifer is a geological formation or group of formations able to receive, store and transmit significant quantities of water.
Australian drinking water guidelines	The <i>National water quality management strategy: Australian drinking water guidelines 6, 2004</i> (NHMRC & NRMMC 2004) (ADWG) outlines acceptable criteria for the quality of drinking water in Australia.
Bore	A bore is a narrow, lined hole drilled into the ground to monitor or draw groundwater.
Bore field	A group of bores to monitor or withdraw groundwater is referred to as a bore field.
Confined aquifer	An aquifer that is confined between non-porous rock formations (such as shale and siltstone) and therefore contains water under pressure.
Health guideline value	The concentration or measure of a water quality characteristic that, based on current knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption (NHMRC & NRMMC 2004).
Hydrocarbons	A class of compounds containing only hydrogen and carbon, such as methane, ethylene, acetylene and benzene. Fossil fuels such as oil, petroleum and natural gas all contain hydrocarbons.
mg/L	A milligram per litre (0.001 grams per litre) is a measurement of a total dissolved solid in a solution.
Nephelometric turbidity units	Nephelometric turbidity units are a measure of turbidity in water.
Nutrients	Minerals, particularly inorganic compounds of nitrogen (nitrate and ammonia) and phosphorous (phosphate) dissolved in water which provide nutrition (food) for plant growth.

Pathogen	A disease-producing organism that can cause sickness and sometimes death through the consumption of water, including bacteria (such as <i>Escherichia coli</i>), protozoa (such as <i>Cryptosporidium</i> and <i>Giardia</i>) and viruses.
Pesticides	Collective name for a variety of insecticides, fungicides, herbicides, algicides, fumigants and rodenticides used to kill organisms.
pH	A logarithmic scale for expressing the acidity or alkalinity of a solution. A pH below seven indicates an acidic solution and above seven indicates an alkaline solution.
Pollution	Water pollution occurs when waste products or other substances (effluent, litter, refuse, sewage or contaminated runoff) change the physical, chemical or biological properties of the water, adversely affecting water quality, living species and beneficial uses.
Public drinking water source area	Includes all underground water pollution control areas, catchment areas and water reserves constituted under the <i>Metropolitan Water Supply Sewerage and Drainage Act 1909</i> and the <i>Country Areas Water Supply Act 1947</i> .
Recharge	Recharge is the action of water infiltrating through the soil/ground to replenish an aquifer.
Recharge area	An area through which water from a groundwater catchment percolates to replenish (recharge) an aquifer. An unconfined aquifer is recharged by rainfall throughout its distribution. Confined aquifers are recharged in specific areas where water leaks from overlying aquifers, or where the aquifer rises to meet the surface.
Treatment	Application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes, including drinking and discharge to the environment.
True colour units	True colour units are a measure of degree of colour in water.
Turbidity	The cloudiness or haziness of water caused by the presence of fine suspended matter.
Water and Rivers Commission	The Water and Rivers Commission has now been replaced by the Department of Water.
Water quality	Water quality is the collective term for the physical, aesthetic, chemical and biological properties of water.

Water reserve	A water reserve is an area proclaimed under the <i>Country Areas Water Supply Act 1947</i> or the <i>Metropolitan Water Supply Sewerage and Drainage Act 1909</i> for the purposes of protecting a drinking water supply.
Wellhead	The top of a well (or bore) used to draw groundwater is referred to as a wellhead.
Wellhead protection zone	A wellhead protection zone (WHPZ) is usually declared around wellheads in public drinking water source areas to protect the groundwater from immediate contamination threats in the nearby area.

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