



Department of Water
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Bolganup Creek Catchment Area drinking water source protection plan



Department of **Water**
Government of Western Australia

Bolganup Creek catchment area drinking water source protection plan

Porongurup settlement water supply

Department of Water

Water resource protection series

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Cover photograph: Bolganup Dam (viewed from near the dam wall) with Porongurup Range in background (Photo: Janet Brown)

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Preface

The Department of Water has prepared this Drinking Water Source Protection Plan to assess risks to water quality within the Bolganup Creek Catchment Area and to recommend management strategies to avoid, minimise or manage those risks. The department is committed to protecting drinking water sources to meet public health requirements and ensure the supply of safe, good quality drinking water to consumers.

The *Australian drinking water guidelines* recommend a risk-based, multiple-barrier approach to protect public drinking water sources. Catchment protection is the first barrier, with subsequent barriers implemented at the water storage, treatment and distribution stages of a water supply system. Catchment protection requires an understanding of the catchment, the hazards and hazardous events that can compromise drinking water quality, and development of preventative strategies and operational controls to ensure the safest possible water supply.

This plan details the location and boundary of the drinking water catchment, which currently provides non-potable water to the Porongurup settlement and may be required in the future to provide drinking water to the Lower Great Southern Town Water Supply Scheme (LGSTWSS). It discusses existing and future use of the water source, describes the water supply system, identifies risks and recommends management approaches to address these risks and maximise protection of the catchment.

This plan should be used to guide state and local government land use management and planning decisions. The Department of Environment and Conservation has a significant role in this catchment through the *Stirling Range and Porongurup National Parks Management Plan 1999–2009*, and the Shire of Plantagenet should recognise this plan in its Town Planning Scheme. Other stakeholders should use this document as a guide for protecting the quality of water in the Bolganup Creek Catchment Area.

The stages involved in preparing this Drinking Water Source Protection Plan are:

Stages in development of a plan		Comment
1	Prepare Drinking Water Source Protection Assessment.	prepared following catchment survey and preliminary information gathering.
2	Conduct stakeholder consultation.	advice sought from key stakeholders using the assessment as a tool for information and discussion.
3	Prepare Draft Drinking Water Source Protection Plan.	draft plan developed taking into account input from stakeholders and any additional advice received.
4	Release Draft Drinking Water Source Protection Plan.	draft plan released for a six-week public consultation period.
5	Publish approved Drinking Water Source Protection Plan.	final plan published after considering advice received in submissions. It includes recommendations on how to protect water quality.

Summary

Bolganup Creek is located approximately 40 km north of the town of Albany on the southern coast of Western Australia, within the Shire of Plantagenet.

Bolganup Dam is currently used by Water Corporation to supply a non-potable water to the Porongurup settlement. It has in the past, and may in the future, be used to supplement the Lower Great Southern Town Water Supply Scheme. This plan will protect water quality for current uses and for potential public water supply in the future.

Bolganup Creek Catchment Area lies mostly within the Porongurup National Park; the park is vested in the Conservation Commission of Western Australia and managed by the Department of Environment and Conservation. The Porongurup and Stirling Range national parks together contain the most significant mountain ranges in southern Western Australia and are registered on the National Estate as important elements in the landscape over a large area. Porongurup National Park is predominantly native forest within which current recreation and conservation activities are supported.

The Bolganup Creek Catchment Area was proclaimed in 1959 under the *Country Areas Water Supply Act 1947* to ensure protection of the water source for public water supply purposes.

Some land use activities in the catchment have the potential to contaminate water and this plan outlines strategies to address these risks. The main risks identified result from recreation and vegetation loss through fire; potentially leading to pathogen, turbidity and chemical contamination.

The boundary of the catchment area has been investigated using current topographical and field observations. This investigation has resulted in minor amendments to the existing catchment boundary.

Given the low level of development in this catchment, while recognising existing recreation infrastructure and tracks developed for the Porongurup National Park, the Department of Water has identified a Priority 1 classification for the entire catchment. A Reservoir Protection Zone has also been identified that will allow for future appropriate recreation development and protection of water quality.

The existing multiple values of this area will require all stakeholders to work in partnership to achieve the best possible outcome for drinking water quality and the National Park. This plan recommends strategies that acknowledge compromises will be required to achieve this outcome.

1 Drinking water source overview

1.1 Existing water supply system

The Bolganup Creek Catchment Area (BCCA) is located on Bolganup Creek, approximately 40 km north of the town of Albany and 20 km east of Mount Barker (see Figure 1).

The existing catchment has an area of 500 ha and is located within the Shire of Plantagenet (Figure 2). Bolganup Dam is an earth fill structure that was constructed in 1957 and upgraded in 1998 to improve safety. It has a wall height of approximately 18 metres. The reservoir covers an area of 4 ha and has a storage volume of 225 megalitres (ML).

The dam currently supplies non-potable water for the Porongurup settlement and farmlands. It has been used for potable supply in the past and it may be used (at short notice) in the future to supplement the Lower Great Southern Town Water Supply Scheme (LGSTWSS). The drying climate in the South West is a particular consideration in this regard (see climate change data in Bureau of Meteorology 2008; Commonwealth Scientific and Industrial Research Organisation & Bureau of Meteorology 2007; Intergovernmental Panel on Climate Change 2007).

1.2 Water treatment

When used as a source for the LGSTWSS, water from the Bolganup Reservoir was transferred to the Mt Barker water treatment plant where it was clarified to reduce colour, iron, aluminium and turbidity levels. It was piped to the Mt Barker service reservoir and blended with water from other sources. The stored, treated water was disinfected by chlorination before being supplied to the towns of Mt Barker and Kendenup.

There is an off-take in the Bolganup to Mt Barker delivery main near the reservoir, where water can be chlorinated at the transfer pump station before being supplied to the Porongurup settlement (presently for non-potable use).

It should be recognised that although treatment is an essential barrier after the dam, catchment management and water source protection are fundamental first barriers for the protection of water quality. This approach is endorsed by the Australian Drinking Water Guidelines (ADWG) (NHMRC & NRMCC 2004a) and reflects a risk-based, 'catchment to consumer' multiple barrier approach for the provision of safe drinking water to consumers.

1.3 Catchment details

1.3.1 Physiography

The BCCA is located on the slopes of the Porongurup Range between Nancy Peak and Devils Slide. The range, which rises abruptly from the surrounding plateau, comprises granite massifs with colluvial slopes over Archean basement rocks (Public Works Department 1984). The BCCA lies mostly within the Porongurup National Park (PNP), which is dominated by karri forest with an understorey of small native shrubs and lichens (forest vegetation is visible in Photos 2 and 3, Appendix B).

1.3.2 Climate

The area has a Mediterranean climate, characterised by warm, dry summers and cool, wet winters.

According to Bureau of Meteorology, the long-term average annual rainfall measured at the Mount Barker weather station over the 121 year period from 1886 to 2007 was 732.4 mm. The average annual rainfall for 1971 to 2000 was 692.6 mm. The rainfall trend indicates that rainfall reduction may continue in the future. The Bolganup Dam may therefore be used (at short notice) in the future to supplement the LGSTWSS. Most of the rainfall is between May and September.

The existing BCCA has an area of 500 ha and varies in elevation from 290 m Australian Height Datum at the reservoir to approximately 500 m Australian Height Datum at the head of the catchment. The highest point in the catchment is at the top of Devils Slide.

Water inflow to the reservoir is mostly from surface runoff over the winter months. The long-term average volume of water entering Bolganup Reservoir was determined to be 300 ML/year and the long term average yield 200 ML/year (Water Corporation 1993). The BCCA inflow has been enhanced by two surface water diversion drains (see Figure 4 and photos 5 and 6, Appendix B).

1.4 Future water supply requirements

No further development of the Bolganup Dam is anticipated. The number of water services expected to be using the Lower Great Southern Town Water Supply Scheme in 2030 is estimated to be in the order of 28 000 (Water Corporation 2001a). The current preferred option for meeting the project demand of 11.65 GL/yr is further upgrading of the South Coast groundwater system and development of a new surface water source on Marbellup Brook (west of Albany town site). The Marbellup Brook Catchment Area Protection Plan was published in 2007.

Development of the Denmark River scheme is seen as the most likely option for increasing supply beyond 2050 (Water Corporation 2001b). However, Bolganup is also available to boost public supply.

1.5 Protection and allocation

1.5.1 Existing water source protection

The BCCA was proclaimed on 26 June 1959 under the *Country Areas Water Supply Act 1947* (CAWS Act) to protect the water source from potential contamination. The currently gazetted and proposed catchment areas are shown in Figure 2.

Prior to this Drinking Water Source Protection Plan (DWSPP), there were no formal priority protection classifications or a Reservoir Protection Zone (RPZ) assigned for this catchment. However, Water Corporation undertakes catchment management as part of the existing water source protection measures for this catchment.

Preventative strategies include:

- surveillance of Bolganup Creek Catchment Area and by-law enforcement
- water quality monitoring within the reservoir.

More information on the existing protection measures is included in Table 1.

1.5.2 Current allocation licence

Water resource use and conservation in Western Australia is administered by the Department of Water in accordance with the *Rights in Water and Irrigation Act 1914* (RIWI Act). Under this Act, the right to use and control surface and groundwater is vested with the Crown. This Act requires licensing of surface water abstraction within proclaimed surface water areas.

Bolganup Creek Surface Water Area was proclaimed in 1997 under the RIWI Act to allocate surface water resources within its boundaries and to manage its sustainable use.

The Water Corporation is licensed by the Department of Water to draw 200 ML per year from Bolganup Dam. Annual extraction in 2002–03 was approximately 98 ML.

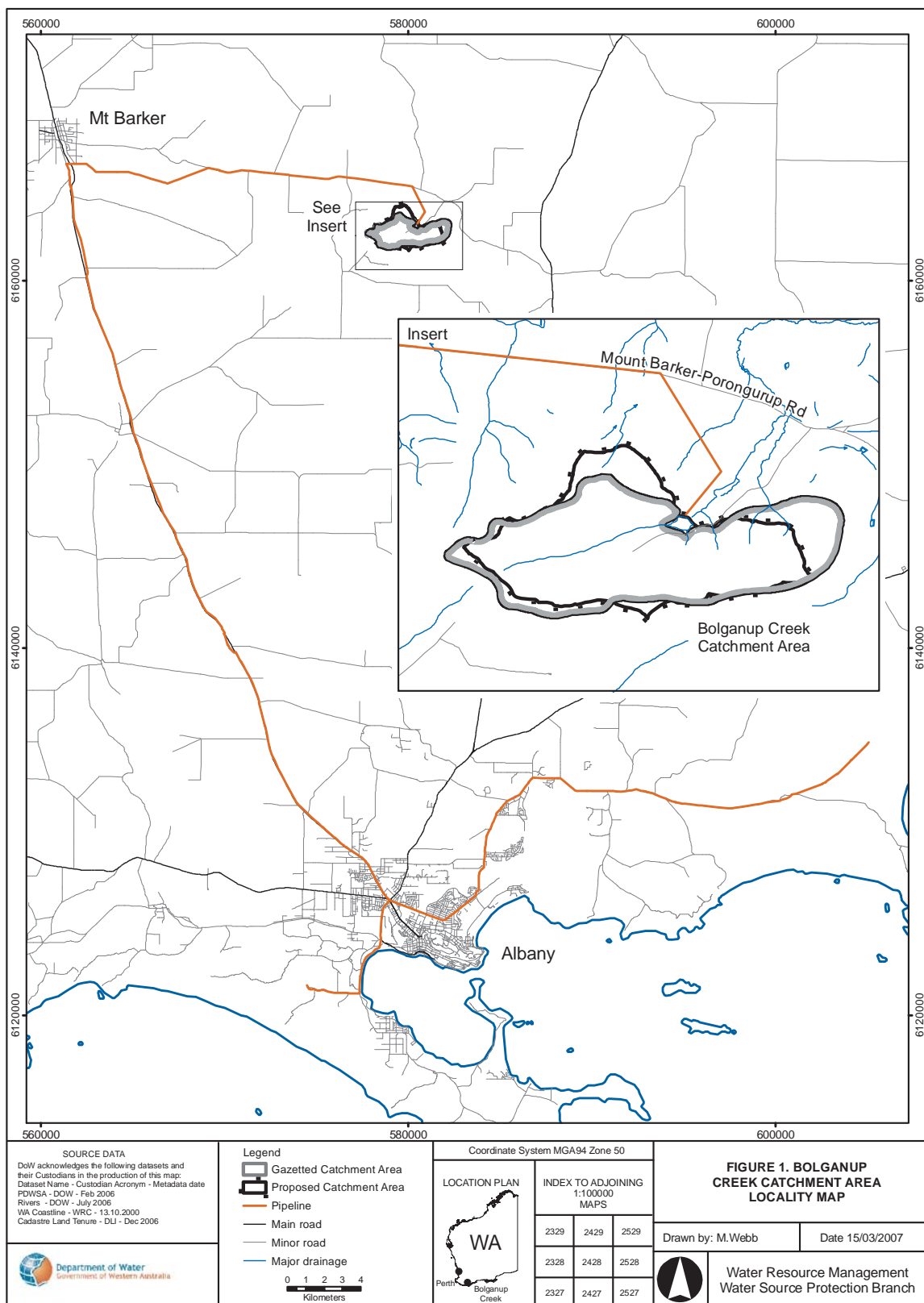


Figure 1 Bolganup Creek catchment area and Lower Great Southern Town Water Supply Scheme locality map

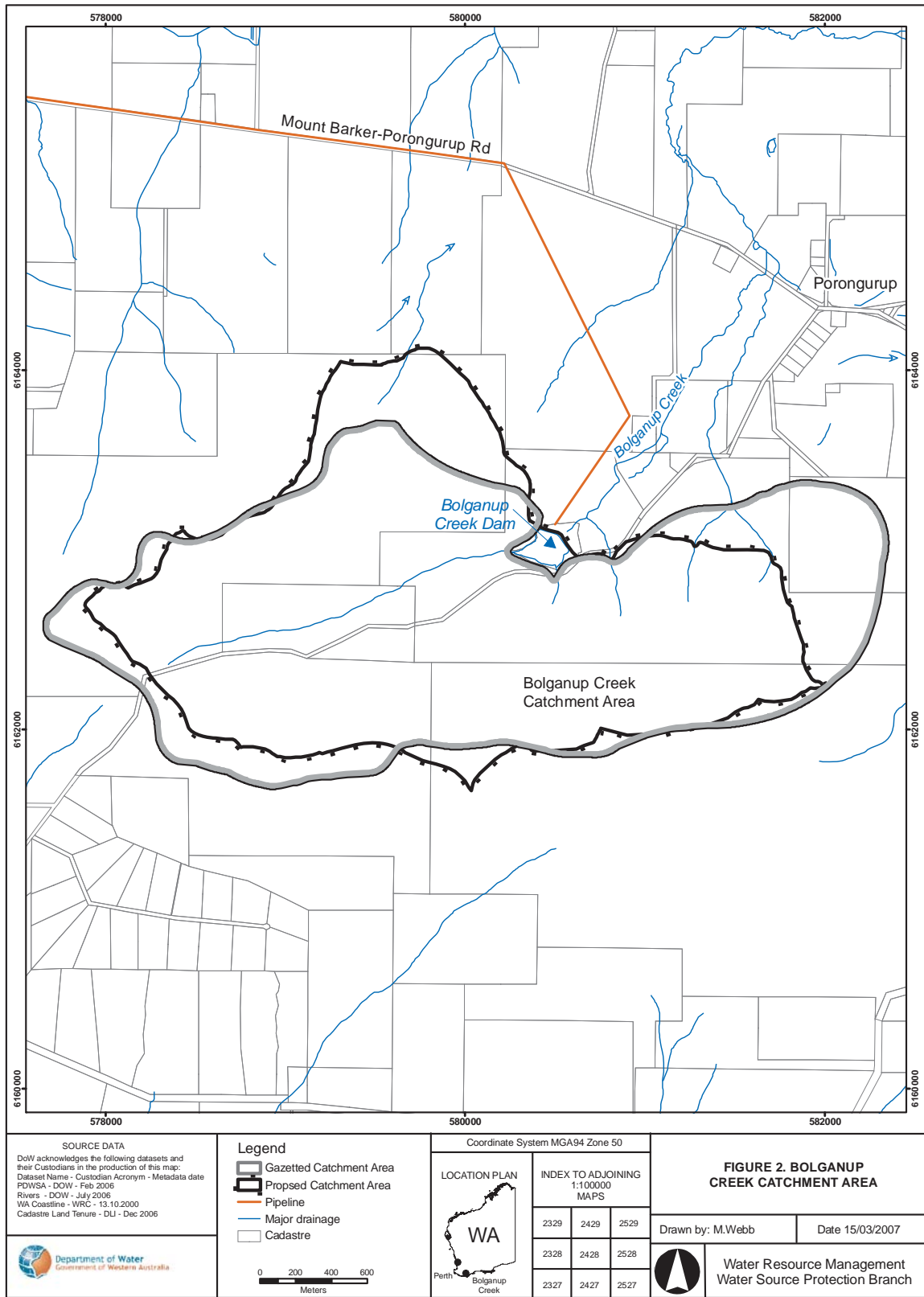


Figure 2 Bolganup Creek catchment area enlarged

2 Water quality monitoring and contamination risks

The Water Corporation monitors the quality of raw (untreated) water from the BCCA in accordance with the ADWG and subsequent catchment risk assessment, and the program set out in the *Lower Great Southern Town Water Supply Scheme Water Resource Management Operation Strategy* (Water Corporation 2002). The results of this monitoring are reviewed by an intergovernmental committee, the Advisory Committee for the Purity of Water which is chaired by the Department of Health.

A water quality summary for the BCCA from January 2002 to March 2007 is presented in Appendix A. For more information on water quality, see the Water Corporation's most recent Drinking Water Quality Annual Report at <www.watercorporation.com.au> Water > Water Quality > Downloads > access the most recent Annual Report.

Contamination risks relevant to the BCCA are described below.

2.1 Microbiological

Pathogens are types of micro-organisms that are capable of causing diseases. These include bacteria (such as *Escherichia coli*), protozoa (such as *Cryptosporidium* and *Giardia*) and viruses. In water supplies the pathogens of concern that can cause illness, such as stomach upset, diarrhoea and even death, are mostly found in the faeces of humans and domestic animals. *Escherichia coli* counts are a way of measuring these pathogens and are an indicator of faecal contamination. *Escherichia coli* is nearly always present in the gut of humans and other warm-blooded animals (NHMRC & NRMCC 2004a) and could enter the reservoir via runoff.

Pathogen contamination of a drinking water source is influenced by the existence of pathogen carriers (that is, humans and domestic animals, such as dogs or cattle); their subsequent transfer to and movement in the water source; and the ability of the pathogen to survive in the water source.

Pathogens may enter a water source through activities involving direct contact with the main water body or its tributaries (such as fishing, marroning and swimming). The contamination occurs by direct transfer of faecal material (even a very small amount can cause contamination), or indirectly through runoff moving faecal material into the water.

There are a number of pathogens that are commonly known to contaminate water supplies worldwide such as *Salmonella*, *Escherichia coli*, cholera, *Cryptosporidium* and *Giardia*. The percentage of humans in the world that carry pathogens varies. For example, it is estimated that between 0.6 to 4.3 per cent of people are infected with *Cryptosporidium* worldwide, and 7.4 per cent with *Giardia* (Geldreich 1996).

The ability of pathogens to survive in surface water differs between species. *Salmonella* may be viable for two to three months, *Giardia* may still infect after one month in the natural environment (Geldreich 1996) and *Cryptosporidium* oocysts (cells containing reproductive spores) may survive weeks to months in freshwater (NHMRC & NRMMC 2004a).

The effect on people consuming drinking water that is contaminated with pathogens is varied, ranging from mild illness (such as stomach upset or diarrhoea) to hospitalisation and death. In Walkerton, Canada in 2000, seven people died due to the contamination of a pathogenic strain of *Escherichia coli* and *Campylobacter* in the town water source and supply (NHMRC & NRMMC 2004b). Preventing the introduction of pathogens into the water source is the most effective barrier in avoiding this public health risk.

2.2 Physical and chemical

Land use activities within the catchment can directly influence the effectiveness of water treatment. For example, driving on unauthorised tracks contributes to erosion and the uprooting of vegetation. Erosion results in the mobilisation of soil particles, which are released into the air and tributaries, increasing the turbidity of the main water body. Pathogens can adsorb onto these soil particles and may be shielded from the effects of disinfection. Increased turbidity also impacts upon other environmental constituents, that is, smothering riparian vegetation and reducing light transfer within the water column which affects plant growth.

A number of chemicals (organic and inorganic) are of concern in drinking water from a health perspective because they are potentially toxic to humans. Chemicals usually occur in drinking water sources attached to suspended material such as soil particles and may result from natural leaching from mineral deposits or from different land uses (NHMRC & NRMMC 2004b)

Pesticides include chemicals such as insecticides, herbicides, nematicides, rodenticides and miticides. Contamination of a drinking water source by pesticides may occur as a result of accidental spills, inappropriate buffers, incorrect use and leakage from storage areas. In such cases, prompt action is required to notify relevant authorities and clean up the spill.

Nutrients (such as nitrogen) can enter drinking water supplies from leaching of fertiliser and septic tanks, and from faeces of domestic animals (such as cattle grazing on the land). Nitrate and nitrite (ions of nitrogen) can be toxic to humans at high levels, with infants less than three months old being most susceptible (NHMRC & NRMMC 2004a).

Hydrocarbons (fuels, oils, solvents) are potentially toxic to humans, and harmful by-products may be formed when they are combined with chlorine in water treatment processes. Hydrocarbons can occur in water supplies from pollution events, runoff

from parking areas and roads, vehicle accidents, refuelling and leakage from storage areas.

Raw water from Bolganup Dam is analysed for nutrients and metals.

2.3 Aesthetic characteristics

Impurities in drinking water can affect the aesthetic qualities of water such as appearance, taste, smell and 'feel'. Such impurities are not necessarily hazardous to human health, for example, water that is cloudy and has a distinctive colour may not be harmful (NHMRC & NRMCC 2004b).

Iron and dissolved organic matter can affect the colour and appearance of water, and salinity can affect the taste. The ADWG set limits on water quality characteristics to meet aesthetic requirements of consumers.

Some properties such as pH can contribute to the corrosion and encrustation of pipes. The ADWG also set out aesthetic guidelines for these types of water quality characteristics.

3 Land-use assessment

3.1 Existing land uses

The existing BCCA lies within Porongurup National Park, Crown Reserve 24151 and a portion of freehold farmland Lot 2484 on Plan 135514 (see Figure 3). Porongurup National Park was gazetted as a national park in 1925. National parks in Western Australia are crown land vested in the Conservation Commission of Western Australia and managed by the Department of Environment and Conservation (DEC). Crown Reserve 24151 is vested in the Water Corporation.

3.1.1 National park

In 1999 CALM (now DEC) prepared Management Plan 42, *Stirling Range and Porongurup National Parks: Management Plan 1999 –2009* (CALM 1999).

Porongurup National Park is patrolled by the resident DEC park ranger. The park is predominantly native forest and includes a few purpose-built trails for bushwalking and sightseeing. The trails in the catchment are the Nancy Peak Circuit, Wansbrough Walk and Bolganup Heritage Trail.

According to Management Plan 42, utilities and services in 1999 were: a Ranger residence and outbuildings; workshop, wash down pad, mobile ranger and fuel storage facilities and storage tanks. The park is traversed by public utility corridors, with the main utilities being radio transmitters, power and telephone lines, and roads. Because of the challenging terrain, the national park has been used for military and HAZMAT and other training purposes.

The main designated picnic area, located mid-catchment and called 'Tree in the Rock' picnic area (see Photo 1), is used as an assembly point for climbing the peaks in the Porongurup Range. It has vehicular parking, including an area for tourist buses, picnic and barbecue facilities, and toilets. The area is serviced by a single bituminised road that cuts across the catchment and passes close to the reservoir.

According to Management Plan 42, the park is important for natural and cultural values. Together with the Stirling Range National Park, they contain the most significant mountain ranges in southern Western Australia and are registered on the National Estate as important elements in the landscape. Porongurup National Park is regarded as a highly significant place to Aboriginal people and figures highly in local Aboriginal beliefs.

Tourism associated with the recreation activities is economically important to the area and forms a part of valuable industry in the south of the state. (There are several accommodation establishments in the area outside the park.)

The Bolganup Reservoir is fenced, but some unauthorised swimming and hunting has occurred. The presence of an on-site ranger limits these activities.

The main picnic area is approximately 620 m from the reservoir. The main picnic area's toilet waste enters a closed system and is removed from the catchment by a liquid waste collection vehicle.

Potential risks or hazards to water quality associated with specific activities in the BCCA, as well as management strategies to deal with them, are listed in Table 1.

3.2 Proposed land uses

The Lower Great Southern Strategy of the Western Australia Planning Commission discusses the limited water resources of the region: 'The strategy recommends the protection of these water resources (existing and proposed), through the preparation of source protection plans and special control areas incorporated into local planning schemes' (WAPC 2007 p xiv).

DEC's Management Plan 42 approaches management of land use and activities from the perspective of conservation and land management. Accordingly, the Department of Water will need to work with DEC to ensure uses are compatible with drinking water source protection requirements.

Given the need to ensure that this catchment is protected, implementing Management Plan 42 (and any review or update) should consider the BCCA and recommendations from this DWSPP. The *Country Areas Water Supply By-laws 1957* and the Conservation and Land Management Regulations 2002 may prevent some land uses or activities within the boundary of the amended BCCA.

The Department of Water will work with DEC and stakeholder and community consultation groups to address issues related to water source protection.

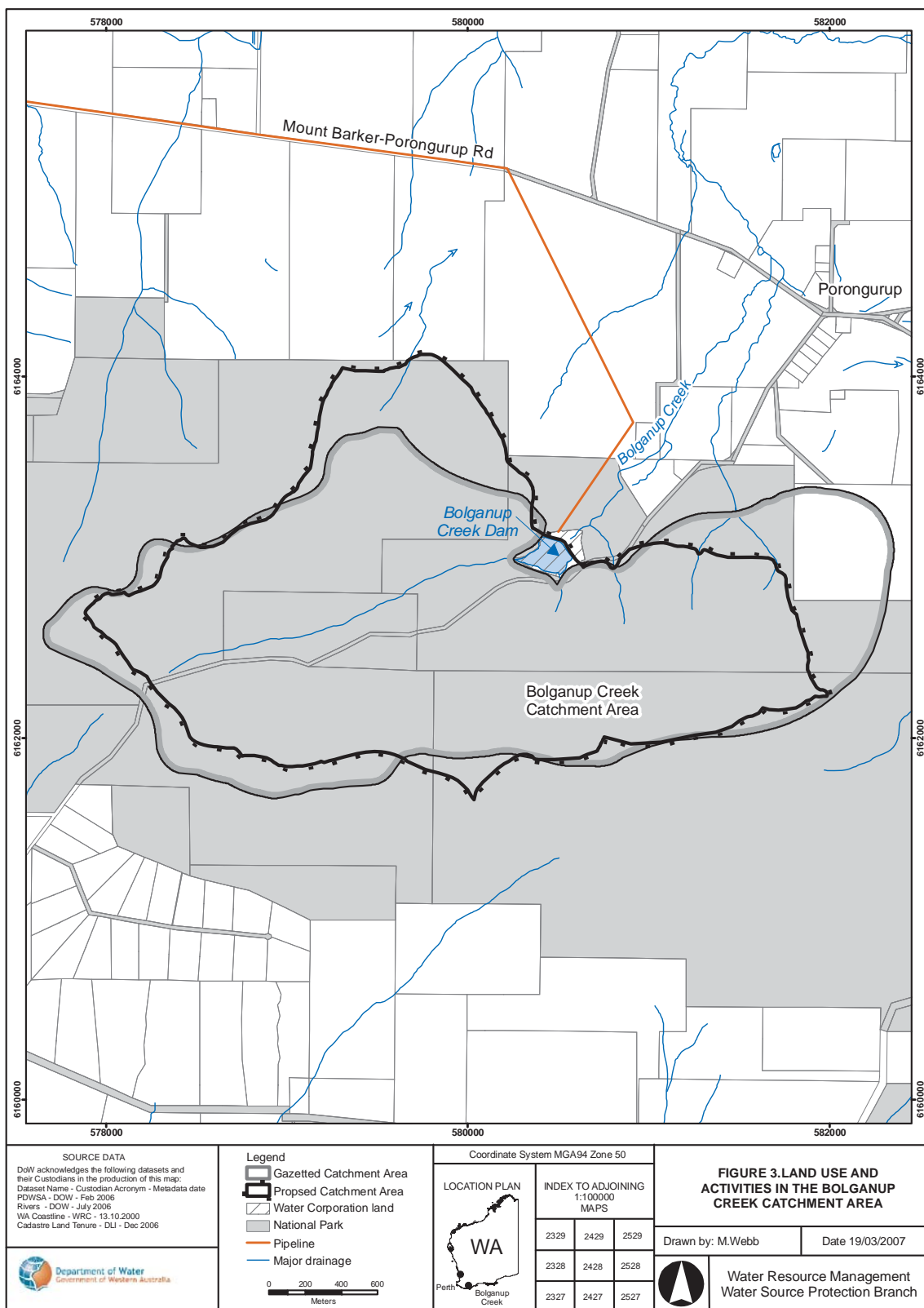


Figure 3 Land use and activities in the Bolganup Creek catchment area

Table 1 Land use, potential water quality risks and recommended strategies

Land use/activity	Potential water quality risks		Consideration for management	Current preventative measures	Recommended protection strategies
	Hazard	Management priority			
Fire management <ul style="list-style-type: none"> • Prescribed burning for fuel reduction and for biodiversity - construction, use and maintenance of firebreaks and water points. • Wildfire management 	<ul style="list-style-type: none"> • Chemical contaminants (e.g. fire retardants, pesticides used for firebreaks) • Pathogen contaminants (e.g. decomposing animals) • Turbidity (e.g. caused by ash and larger material) 	<p>Medium</p> <p>High</p> <p>High</p>	<p>Wildfire minimisation by fuel reduction burning is an established essential land management practice.</p> <p>DEC is responsible for fire management.</p> <p>The catchment area was swept by a significant wildfire in February 2007. The beneficial vegetation barriers previously around the reservoir and river tributaries were detrimentally affected and the reservoir was observed to become significantly more turbid.</p>	<ul style="list-style-type: none"> • Controlled fuel reduction burning programs • A ban on camp fires within PNP • State Wildfire Emergency Management Plan • Water Corporation and DEC rangers: surveillance, attendance of fires and post fire management of catchment 	<p>Fire management is accepted as a necessary activity in a national park, with control and best management practices (e.g. Department of Health PSC 88; Statewide Policy No. 2, Water and Rivers Commission 2000).</p> <p>Liaise closely with DEC, Water Corporation and WESTPLAN-HAZMAT personnel.</p> <ul style="list-style-type: none"> • Agree on suitable points to access water for fire control. • Stabilise firebreaks; use table drains to minimise erosion. • Protect filtering vegetation buffers around the reservoirs and streams (Department of Water WQPN <Vegetation buffers to sensitive water resources>. <p>After a fire</p> <ul style="list-style-type: none"> • Assess sites on need for mitigation works. • Rehabilitate emergency firebreaks as soon as practicable.
Infrastructure construction,	<ul style="list-style-type: none"> • Chemical contaminants (e.g. 	<p>Medium</p>	<p>Public roads need to be properly designed.</p>	<ul style="list-style-type: none"> • main road into 	<p>Infrastructure construction, maintenance and use is accepted as a necessary</p>

Land use/activity	Potential water quality risks		Consideration for management	Current preventative measures	Recommended protection strategies
	Hazard	Management priority			
<p>maintenance and use</p> <ul style="list-style-type: none"> • Roads, tracks and trails (the use of trails is also discussed with other related recreational activities) • Power lines • Telephone lines and towers • Pipelines 	<p>hydrocarbons, herbicides).</p> <ul style="list-style-type: none"> • Pathogen contaminants. • Turbidity resulting from erosion and uprooting of vegetation. • Forest disease (e.g. <i>Phytophthora</i>) that spreads and reduces vegetation buffers). <p>Disturbed land could result from gravel extraction and vegetation clearing for e.g. road construction.</p>	<p>High</p> <p>High</p> <p>Low</p>	<p>Some roads, trails and tracks are necessary for park operations and catchment management. Infrastructure must be maintained.</p>	<p>catchment is bitumised and ends at the main picnic area.</p> <ul style="list-style-type: none"> • HAZMAT emergency response requirements 	<p>activity in a national park, with control and best management practices. Ensure that protocols are in place for effective communication between agencies managing the catchment.</p> <ul style="list-style-type: none"> • Consider WQPN <Roads near sensitive water resources > and <Tracks and trails near sensitive water resources>. • Provide trail literature and information boards at picnic spots to advise users of drinking water catchments, prohibited zones and regulations. • Ensure environmental management plans address water quality protection objectives. • Restrict gravel extraction to outside the RPZ, in accordance with the following: <ul style="list-style-type: none"> a) WQPN <Extractive industries within Public Drinking Water Source Areas> b) CALM's Policy Statement No. 2 Local Government Access to Basic Raw Materials from State Forest and Timber Reserves c) Policy Statement No. 10 Rehabilitation of Disturbed Land and the Guidelines for Management and Rehabilitation of Gravel Pits.

Land use/activity	Potential water quality risks		Consideration for management	Current preventative measures	Recommended protection strategies
	Hazard	Management priority			
Recreation <ul style="list-style-type: none"> • Swimming, Fishing and marroning • Bushwalking along trails • Picnicking • Camping • Cycling • Horse riding • Mountain biking • Rock climbing • Hunting/ Trapping 	<ul style="list-style-type: none"> • Pathogen contaminants • Turbidity resulting from erosion • Chemical contaminants (e.g. hydrocarbons) 	<p>High</p> <p>Medium/ High</p> <p>Low/ Medium</p>	<ul style="list-style-type: none"> • Instances of unauthorised swimming in Bolganup Reservoir. • Porongurup National Park management plan lists strategies to increase picnic facilities and a range of adventure activities; to liaise with mountain bike enthusiasts for a designated path. 	<ul style="list-style-type: none"> • Surveillance by a DEC park ranger living in the national park, and inspection by a Water Corporation ranger. • Bolganup Reservoir is fenced with ongoing surveillance. • Detention time in dam. • Water quality monitoring • Hunting, trapping and dogs are prohibited by DEC in the national park. • Signage, gates and 	<p>Current approved recreation is supported with control and best management practices.</p> <ul style="list-style-type: none"> • All recreational activities within the catchment should consider Statewide Policy No. 13–Policy and Guidelines for Recreation within Public Drinking Water Source Areas on Crown Land (Water and Rivers Commission 2003). This policy is being publicly reviewed in 2008–09. • DEC utilises the complementary <i>Conservation and Land Management Regulations (2002)</i> to prevent contamination. • Comply with specific by-laws dealing with recreation matters under the CAWS Act. • No recreation is supported in the RPZ. • Use signs and promotional material to ensure public awareness. • Undertake surveillance (including after-hours) and by-law enforcement as appropriate. • Swimming, fishing and marroning are not allowed in the catchment. • Ensure designated picnic/overnighting areas are outside the RPZ. Appropriate toilet facilities (see WQPN

Land use/activity	Potential water quality risks		Consideration for management	Current preventative measures	Recommended protection strategies
	Hazard	Management priority			
				fencing	<p>recommendations <Wastewater treatment-onsite domestic systems>).</p> <ul style="list-style-type: none"> • Provide trail literature, signage and information boards at picnic spots (see Photo 4) to advise users of drinking water catchments, prohibited zones and regulations. • Camping at undesignated camping sites is prohibited in the catchment. • Review public access consistent with Policy 13 and its 2008/9 review.
Rubbish dumping Unauthorised	<ul style="list-style-type: none"> • Pathogen contaminants (e.g. from domestic rubbish) • Chemical contaminants (e.g. heavy metals, fuel and other contamination from domestic building or industrial waste; dumping of stolen cars) 	<p>High</p> <p>Low</p>	<ul style="list-style-type: none"> • Rubbish dumping is often associated with informal or unauthorised recreation or access. Controlling access tracks and roads will limit the risk. • Authorised recreation: Porongurup National Park follows a 'Take-your-litter-home' policy. The waste leaves the catchment when visitors observe the policy. 	<ul style="list-style-type: none"> • An on-site ranger limits the occurrence and lessens the risk of these activities to the drinking supply. 	<ul style="list-style-type: none"> • Rubbish dumping is prohibited in the catchment. • Develop a coordinated inter-agency plan. Work with community groups and local governments to avoid rubbish dumping in the catchment. • Use signage and advertising material to ensure public awareness that rubbish dumping is not permitted and is harmful. • Review road network and close roads not essential for park operations, management and transport thoroughfare. • Undertake surveillance with by-law enforcement.

Land use/activity	Potential water quality risks		Consideration for management	Current preventative measures	Recommended protection strategies
	Hazard	Management priority			
Research activities	<ul style="list-style-type: none"> • Pathogens • Turbidity resulting from erosion • Chemical contaminants (e.g. hydrocarbons) 	<p>High Medium/ High</p> <p>Low</p>	<p>Research groups are active in the national park, including a university group working on the Bolganup Reservoir.</p> <p>A key strategy of the national park management plan is to encourage research activities in several fields.</p>		<p>Acceptable activity with conditions.</p> <ul style="list-style-type: none"> • Undertake education on water quality protection requirements. Apply a condition of approval that requires adherence. • Seek approvals from DEC, Department of Water and Water Corporation.
The control/ hunting of animals (feral/ introduced/ nuisance organisms) e.g. to protect biodiversity	<ul style="list-style-type: none"> • Pathogens (e.g. from carcasses) • Chemical contaminants (e.g. from decomposing material, uneaten baits, pesticides, activities of hunters) • Turbidity (e.g. from erosion) 	<p>Low</p> <p>Low</p> <p>Low</p>	<p>Shooting, trapping or hunting of game is prohibited in the National Park (unless for official pest control), as is the presence of dogs.</p>	<ul style="list-style-type: none"> • Water Corporation undertakes feral pig control using the 'trap and shoot' method, significantly reducing the risks 	<p>Accepted as a necessary activity, with control and best management practices</p> <ul style="list-style-type: none"> • Ensure hunting is performed by the 'trap and shoot' method, without the use of dogs. • Ensure baits located away from the reservoir and tributaries. • Maintain Bolganup Reservoir's fence • Water Corporation and DEC surveillance.

4 Catchment protection strategy

4.1 Protection objectives

The objective of water source protection in the BCCA is to protect water quality by avoiding risks of contamination wherever possible, otherwise a risk minimisation and/or management approach will be adopted. This plan aims to balance water quality protection and social and environmental needs and aspirations.

The management objective for the Bolganup Creek Catchment Area (BCCA) is to preserve and protect the high quality of raw water for public drinking supplies by avoiding the risk of contamination from inappropriate land uses and activities (see Table 1).

4.2 Proclaimed area

The BCCA was proclaimed in 1959 under the CAWS Act to ensure protection of the water source from potential contamination. The boundary of the catchment area has recently been reconsidered using topographical and field observations, and amendments to the boundary are being proposed. It is recommended that this updated boundary be gazetted as the catchment area under the CAWS Act to ensure adequate protection of the water supply. The proposed BCCA boundary is shown in Figure 4.

4.3 Priority areas

The Department of Water's Water Quality Protection Note, *Land use compatibility in Public Drinking Water Source Areas*, forms an integral part of the Western Australian Planning Commission's Statement of Planning Policy No. 2.7—*Public Drinking Water Source Policy* (2003). Based on this guide, a P1 priority classification is proposed for all of the BCCA to manage the catchment to ensure that there is no degradation of the potential drinking water source by preventing the development of potentially harmful activities in these areas. The proposed catchment area is entirely situated on crown land. It supplies the Porongurup settlement's non-potable water source and may in future be required to contribute, at short notice, to the LGSTWSS (see Figure 4).

4.4 Protection zones

The aim of a Reservoir Protection Zone (RPZ) is to protect water quality by preventing land uses and activities from occurring in the RPZ, including public access (except along public roads).

In order to accommodate the existing conservation and recreational activities of the national park, a modified RPZ is proposed (see Figure 4). For metropolitan surface water sources, this zone would extend 2 km from the reservoir. However, at the BCCA this would result in nearly the whole catchment being covered by the RPZ. An alternative option is to apply the RPZ to land around the reservoir extending up to the

existing DEC walk trail loop (near the main picnic area 'Tree in the Rock'), and across to the constructed drains feeding the reservoir.

The constructed drains are not vegetated and do not provide a filter for contamination. These drains will also provide an easily defined boundary. Therefore the RPZ was extended along the length of the drains (see Figure 4 and Photos 5 and 6, Appendix B).

It is important to note that existing approved facilities in the BCCA would be recognised (the walk trails and facilities managed by DEC). However, expansion of those facilities, or new activities/facilities in the RPZ would not be supported because of the increased risk posed to water quality and public health.

4.5 Land-use planning

The Department of Environment and Conservation has responsibilities for management planning over the majority of this catchment area under the Conservation and Land Management Act 1984.

It is also recognised under the *State Planning Strategy* (Western Australian Planning Commission 1997) that the establishment of appropriate protection mechanisms in statutory land use planning processes is necessary to secure the long-term protection of drinking water sources. As outlined in *Statement of Planning Policy: 2.7 Public drinking water source policy* (Western Australian Planning Commission 2003) it is appropriate that the BCCA, RPZ and protection classification (Priority 1) be recognised in the Shire of Plantagenet's Town Planning Scheme.

Therefore, given the multiple values of the catchment (e.g. National Park purpose and drinking water supply) and statutory roles and responsibilities of state and local government agencies, it is appropriate that any development proposals within the BCCA that are inconsistent with advice within the Department of Water's water quality protection note: *Land use compatibility in public drinking water source areas* or recommendations in this plan, should be referred to the Department of Water.

The department's protection strategy for public drinking water source areas (PDWSA) provides for lawfully established and operated developments to continue despite their location or facilities posing a level of risk to water quality which would not be accepted for new developments. The department may negotiate with landowners and operators on measures to improve these facilities or processes to lessen the level of water contamination risk.

Education and awareness (for example, signage and information) are key mechanisms for water quality protection, especially for those people visiting the area who are unfamiliar with the BCCA. A brochure will be produced, describing the BCCA, its location and the main threats to water quality. This brochure will be available to the community and will inform people about the drinking water source and the need to protect it.

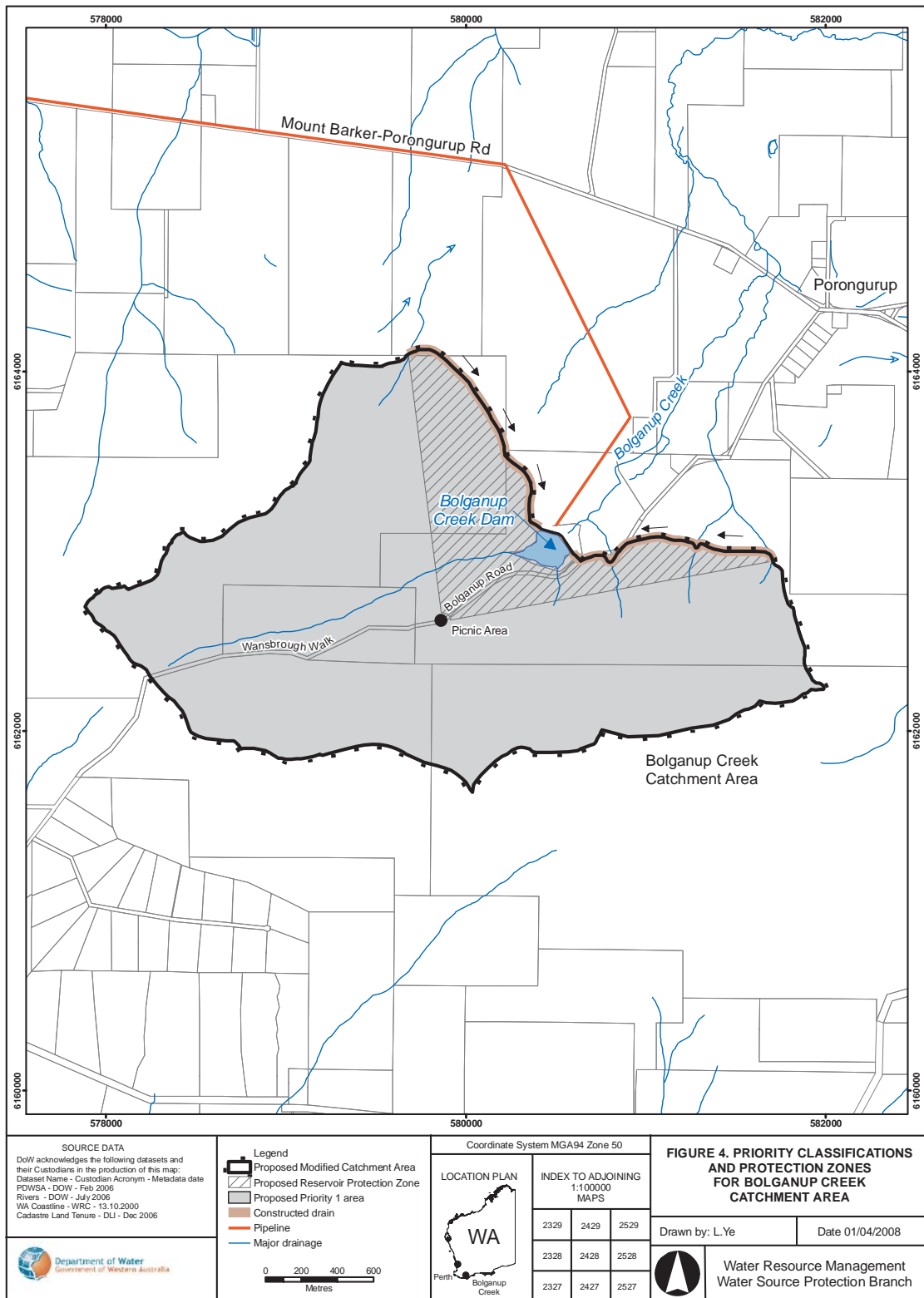


Figure 4 Proposed protection classification and reservoir protection zone for Bolganup Creek catchment area

4.6 Best management practices

There are opportunities to significantly reduce risks to water quality by carefully considering design and management practices. The adoption of best management practices for land uses will continue to be encouraged to help protect water quality. The Department of Water aims to work with landowners and land managers to achieve best management practices for water quality protection by providing management advice.

There are guidelines available for many land uses in the form of industry codes of practice, environmental guidelines or Water Quality Protection Notes. These have been developed in consultation with stakeholders such as industry groups, producers, state government agencies and technical advisers. Examples include *Tracks and trails near sensitive water resources*; *Vegetation buffers to sensitive water resources*; *Roads near sensitive water resources*; and *Wastewater treatment- onsite domestic systems*, which are listed in the References section of this document. The guidelines help managers reduce the risk of their operations causing unacceptable water quality impacts. They are recommended as best practice for water quality protection.

4.7 Surveillance and by-law enforcement

The quality of public drinking water sources within country areas of the state is protected under the CAWS Act. Proclaiming these areas allows existing by-laws to be applied to protect water quality.

The Department of Water considers by-law enforcement, through surveillance of land use activities in PDWSA, as an important mechanism to protect water quality.

Signs are erected around PDWSA boundaries to educate the public and to advise of activities that are prohibited or regulated. This plan recommends that delegation of surveillance and by-law enforcement to the Water Corporation be continued.

4.8 Emergency response

Escape of contaminants during unforeseen incidents and the use of chemicals during emergency responses can result in water contamination. Wildfire response for the majority of the catchment, outside the gazetted fire emergency response zone, is the responsibility of DEC. The Shire of Plantagenet's Local Emergency Management Committee (LEMC), through the Great Southern Emergency Management District, should be familiar with the location and purpose of the BCCA.

A locality plan, which includes the boundaries of the BCCA, should be provided to the fire and rescue services headquarters for the Hazardous Materials (HAZMAT) Emergency Advisory Team. The Water Corporation should have an advisory role to any HAZMAT incident in the BCCA.

Personnel who deal with fires and WESTPLAN–HAZMAT (Western Australian Plan for Hazardous Materials) incidents within the area should have access to a map of the BCCA. These personnel should have an adequate understanding of the potential impacts of emergency incidents on this drinking water resource.

4.9 Implementation of this plan

Table 1 identifies the potential water quality risks associated with existing land uses in the BCCA and recommends protection strategies to minimise these risks.

Following publication of the final BCCA Drinking Water Source Protection Plan, an implementation strategy will be drawn up based on the recommendations in Table 1. It will describe timeframes for the recommended protection strategies and identify responsible stakeholders and sources of funding. This is reflected in the recommendations section of this plan.

5 Recommendations

The following recommendations will protect the quality of water available from the Bolganup Creek Catchment Area. Key stakeholders for these recommendations are identified in brackets.

- 1 The boundary of the Bolganup Creek Catchment Area should be amended (see Figure 4) under the *Country Areas Water Supply Act 1947 (Department of Water)*.
- 2 Implement the recommended protection strategies as detailed in *Table 1: Land use, potential water quality risks and recommended strategies* of this Plan (*Applicable stakeholders*).
- 3 The Shire of Plantagenet's Town Planning Scheme No. 3 should reflect this plan and the amended Bolganup Creek Catchment Area boundary, the Priority 1 area and Reservation Protection Zone in accordance with Statement of Planning Policy No. 2.7–*Public Drinking Water Source Policy (Shire of Plantagenet)*.
- 4 All development proposals within the Bolganup Creek Catchment Area that are inconsistent with the Department of Water's Water Quality Protection Note–*Land use compatibility in public drinking water source areas* or recommendations in this DWSP should be referred to the Department of Water for advice and recommendations (*Department for Planning and Infrastructure, Department of Environment and Conservation, Shire of Plantagenet, Proponents of proposals*).
- 5 Incidents covered by WESTPLAN–HAZMAT in the Bolganup Creek Catchment Area should be addressed through the following:
 - the Shire of Plantagenet's Local Emergency Management Committee is aware of the location and multiple purpose of the Bolganup Creek Catchment Area;
 - the locality plan for the Bolganup Creek Catchment Area is provided to the Fire and Rescue headquarters for the HAZMAT Emergency Advisory Team;
 - the Water Corporation provides an advisory role during incidents in the Bolganup Creek Catchment Area; and
 - personnel dealing with WESTPLAN–HAZMAT incidents in the area have ready access to a locality map of the Bolganup Creek Catchment Area and information to help them recognise the potential impacts of spills on drinking water quality (*Department of Water, Water Corporation*).
- 6 The existing surveillance program should be maintained to identify any incompatible land uses or potential threats within the Bolganup Creek Catchment Area (*Water Corporation*).
- 7 Signs should be erected and maintained along the boundary of the Bolganup Creek Catchment Area and the Reservoir Protection Zone to define the location and promote awareness of the need to protect drinking water quality. Signs should include an emergency contact telephone number (*Water Corporation, Department of Water, Department of Environment and Conservation*).
- 8 Any management plans produced by the Department of Environment and Conservation, Department of Water or Water Corporation within the Bolganup

Creek Catchment Area should be properly consulted to achieve the best outcome for the multiple values of this area. (*Department of Environment and Conservation, Department of Water, Water Corporation*).

- 9 A review of this plan should be undertaken after five years (*Department of Water, Department of Environment and Conservation, Water Corporation*).

Appendices

Appendix A - Water quality

The Water Corporation has monitored the raw (source) water quality from Bolganup Reservoir in accordance with the Australian Drinking Water Guidelines (ADWG) and interpretations agreed to with the DoH. Appendix A has been prepared by the Water Corporation to reflect this data. The raw water is monitored regularly for:

- aesthetic characteristics (non-health related)
- health-related characteristics including
 - health-related chemicals
 - microbiological contaminants

Following is data representative of the quality of raw water in Bolganup Dam. 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 customer's 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 exist downstream of the raw water to ensure it meets the requirements of the ADWG. The values are taken from ongoing monitoring for the period January 2002 to March 2007.

Any water quality parameters that have been detected are reported; those that on occasion have exceeded the ADWG are shaded.

For more information on the quality of drinking water supplied to the Albany and surrounding localities through the Lower Great Southern Town Water Supply Scheme refer to the most recent Water Corporation *Drinking Water Quality Annual Report* at <www.watercorporation.com.au> Publications > Annual Reports > Drinking Water Quality Annual Report.

Aesthetic characteristics

Aesthetic water quality analyses for raw water from Bolganup Dam are summarised in Table 1.

Table 1 Aesthetic related detections for Bolganup Dam

Parameter	Units	ADWG Aesthetic Guideline Value*	Bolganup Dam SP Porongurups	
			Range	Median
Aluminium acid soluble	mg/L	0.2	0.24-0.26	0.24
Aluminium unfiltered	mg/L	na	0.3-6.4	0.99
Chloride	mg/L	250	85-110	105
Colour-True	TCU	15	17-85	43
Conductivity (25°C)	mS/m	na	27-52	37
Hardness as CaCO ₃	mg/L	200	30-39	34
Iron unfiltered	mg/L	0.3	0.6-4.4	1.6
Manganese unfiltered	mg/L	0.1	0.004-0.8	0.012
pH	NOUNIT	6.5-8.5	6.1-7.3	6.7
Sodium	mg/L	180	47-62	57
Sulphate	mg/L	250	7-10	7.5
TFSS	mg/L	500	188-235	227
Turbidity	NTU	5	3.2-37	12

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

Health-related characteristics

Raw water from Bolganup Dam is analysed for health-related chemicals including inorganics, heavy metals. Health-related water quality parameters are summarised in the following table.

Table 2 Health related detections for Bolganup Dam

Parameter	Units	ADWG Health Guideline Value*	Bolganup Dam SP Porongurups	
			Range	Median
Barium	mg/L	0.7	0.035-0.045	0.04
Boron	mg/L	4	0.03-0.03	0.03
Fluoride	mg/L	1.5	0.15-0.2	0.2
Nitrite as nitrogen	mg/L	0.91	0.005-0.009	0.007
Nitrite plus nitrate as N	mg/L	11.29	<0.05-0.085	<0.05

* 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 (NHMRC & ARMCANZ, 1996).

Microbiological contaminants

Microbiological testing of raw water samples from Bolganup Reservoir is currently conducted monthly. *Escherichia coli* counts are used as an indicator of the degree of recent faecal contamination of the raw water from warm-blooded animals. A count of less than 20 MPN (most probable number) per 100 mL (millilitre) sample is typically associated with low levels of faecal contamination and is used as a microbiological contamination benchmark of the raw water (WHO, 1996). As such, counts less than 20 MPN are seen as being an indication of raw water that has not been recently contaminated with faecal material.

During the reviewed period of January 2002 to March 2007, positive *Escherichia coli* counts were recorded in 69% of samples. Approximately 21% of these samples had *Escherichia coli* counts greater than 20 MPN/100mL.

Appendix B - Photographs



Photo 1 The main picnic area in Porongurup National Park. The signage indicates that overnight camping is not allowed.



Photo 2 Picnic and information facilities at the main picnic area, Porongurup National Park



Photo 3 Nancy Peak Circuit (one of the hiking trails in Porongurup National Park). The dense surrounding forest is visible.



Photo 4 Existing educational signage in Porongurup National Park and Bolganup Creek Catchment Area



Photo 5 The effect of the February 2007 fire on the vegetation and the constructed drain (visible in right foreground) which leads down to the Bolganup Reservoir (in the background) Photo credit: Shane Caudwell 2007



Photo 6 The constructed drain on the east of Bolganup Reservoir

Glossary

Terminology and acronyms/abbreviations

abstraction	the pumping of groundwater from an aquifer, or the removal of water from a waterway or water body
adsorb	to accumulate on the surface
ADWG	The Australian Drinking Water Guidelines, outlining acceptable criteria for the quality of drinking water in Australia
Aesthetic guideline	a water-quality criteria in the ADWG associated with acceptability of water to the consumer, for example, appearance, taste and odour (NHMRC & NRMCC 2004a)
AHD	Australian Height Datum is the height of land in metres above mean sea level. For example, this is +0.026 m at Fremantle.
allocation	the quantity of water permitted to be abstracted by a licensee, usually specified in kilolitres per annum (kL/a)
ANZECC	Australian and New Zealand Environment Conservation Council
aquifer	a geological formation or group of formations able to receive, store and transmit significant quantities of water
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
BCCA	Bolganup Creek Catchment Area
CALM	Department Conservation and Land Management WA (now part of DEC)
catchment	area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater
CAWS	Country Areas Water Supply Act 1947
DEC	The Department of Environment and Conservation was established on 1 July 2006, bringing together the Department of Environment (DoE) and the Department of Conservation and Land Management (CALM).
detention time	The amount of time a theoretical particle/water drop remains in a container such as a reservoir, tank (the product of capacity divided

by flow).

DoH	Department of Health WA
DWSP	Drinking Water Source Protection Plan
GL	Gigalitre (1,000,000,000 litres) or one million kilolitres
HAZMAT	Hazardous materials
Health guideline	a water-quality criteria in the ADWG associated with human health that, based on present knowledge, does not result in any significant risk to the consumer over a lifetime of consumption (NHMRC & NRMMC 2004a)
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.
leaching/ leachate	the process by which materials such as organic matter and mineral salts are washed out of a layer of soil or dumped material by being dissolved or suspended in percolating rainwater. The material washed out is known as leachate. Leachate can pollute groundwater and waterways.
LEMC	Local Emergency Management Committee
LGSTWSS	Lower Great Southern Town Water Supply Scheme
mL	millilitre
ML	megalitre (1 000 000 litres = one million litres)
MPN	most probable number (a measure of microbiological contamination)
mS/m	milliSiemens per metre is a measure of the electrical conductivity of a solution of soil and water mix that provides a measurement of salinity.
NHMRC	National Health and Medical Research Council
non potable	not intended for human drinking purposes
NRMMC	Natural Resource Management Ministerial Council
NTU	Nephelometric turbidity units are a measure of turbidity in water.
nutrients	minerals dissolved in water, particularly inorganic compounds of

nitrogen (nitrate and ammonia) and phosphorous (phosphate) which provide nutrition (food) for plant growth. Total nutrient levels include the inorganic forms of an element plus any bound in organic molecules.

oocysts cells containing reproductive spores

pathogen a disease producing organism that can cause sickness and sometimes death through the consumption of water, including bacteria (such as *Escherichia coli*), protozoa (such as *Cryptosporidium* and *Giardia*) 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.

PNP Porongurup National Park

pollution Water pollution occurs when waste products or other substances, for example, effluent, litter, refuse, sewage or contaminated runoff, change the physical, chemical, biological or thermal properties of the water, adversely affecting water quality, living species and beneficial uses.

PSC 88 a state government circular produced by the Department of Health providing guidance on appropriate herbicide use within water catchment areas

Public Drinking Water Source Area (PDWSA) all underground water pollution control areas, catchment areas and water reserves constituted under the *Metropolitan Water Supply Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947*

reservoir a reservoir, dam, tank, pond or lake that forms part of any public water supply works

Reservoir Protection Zone (RPZ) a buffer measured from the high water mark of a drinking water reservoir, and inclusive of the reservoir (usually 2 km). This is referred to as a 'Prohibited Zone' under the *Metropolitan Water Supply, Sewerage and Drainage Act By-laws 1981*.

RIWI Rights in Water and Irrigation Act 1914

runoff water that flows over the surface from a catchment area, including

	streams
TCU	true colour units (a measure of degree of colour in water)
treatment	application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes, including drinking and discharge to the environment
turbidity	the cloudiness or haziness of water caused by the presence of fine suspended matter
WAPC	Western Australian Planning Commission
wastewater	water that has been used for some purpose and would normally be treated and discarded. Wastewater usually contains significant quantities of pollutant.
water quality	the physical, chemical and biological measures of water
Water Reserve	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
WESTPLAN–HAZMAT	Western Australian Plan for Hazardous Materials (

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