



Important information

The *Preston Beach Water Reserve drinking water source protection plan* (2006, WRP no. 57) was reviewed in 2019.

Please ensure you read the *Preston Beach Water Reserve drinking water source protection review* (2019, WRP no. 192) alongside the 2006 plan to obtain all of the information about this drinking water source.

The 2019 review considers changes that have occurred in and around the water reserve since the completion of the 2006 plan. Additional recommendations have been prepared to ensure the ongoing protection of this public drinking water source area.

You can find the 2019 *Preston Beach Water Reserve drinking water source protection review* at www.dwer.wa.gov.au or by contacting the Department of Water and Environmental Regulation on +61 8 6364 7000 or drinkingwater@dwer.wa.gov.au.



Department of Water
Government of Western Australia



Preston Beach
Drinking Water Source Protection Plan
Preston Beach Town Water Supply

Water Resource Protection Series

REPORT NO.57
APRIL 2006



Department of Water
Government of Western Australia

Preston Beach Water Reserve Drinking Water Source Protection Plan

Preston Beach Town Water Supply

Prepared by
Water Resources Division
Department of Water

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We welcome your feedback

A publication feedback form can be found at the back of this report, or online at www.water.wa.gov.au/public/feedback/

This document is available in alternative formats such as audio tape, computer disk, large print, braille and other languages.

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Cover photograph: Lake Preston

Purpose of this plan

The Department of Water (the Department) has prepared this Drinking Water Source Protection Plan (DWSPP) to report on the activities and risks to water quality within the Preston Beach Water Reserve and to recommend management strategies to minimise the identified risks.

A safe drinking water supply is critical to the well-being of a community and catchment protection is necessary to help avoid, minimise or manage risks to water quality in Public Drinking Water Source Areas (PDWSA). The Department is committed to protecting these areas to ensure the continued supply of 'safe, good quality drinking water' to consumers to protect public health now and in the future.

The Australian Drinking Water Guidelines 1996 (ADWG) recommend a multiple barrier 'catchment to consumer' approach to protect public drinking water. The protection and management of PDWSA is the 'first barrier', with subsequent barriers implemented at the water storage, treatment and distribution stages of a water supply system. Catchment protection includes:

- understanding the catchment, the hazards and hazardous events that can compromise drinking water quality; and

- developing and implementing preventive strategies and operational controls necessary to ensure the safest possible raw water supply (ie before treatment). This plan details the location and boundary of the drinking water catchment which provides potable water to the Preston Beach Town Water Supply System. It discusses existing and future usage of the water source, describes the water supply system, identifies risks and recommends management approaches to maximise protection of the catchment.

The plan should be used to guide State and local government land use planning decisions in Western Australia. This plan should be recognised in the Shire of Waroona and Shire of Harvey Town Planning Scheme and other local planning strategies and plans, consistent with the Western Australian Planning Commission's Statement of Planning Policy No. 2.7 Public Drinking Water Source Policy. Other stakeholders should use this document as a guide for protecting the quality of water in the PDWSA.

The process involved in the preparation of a DWSPP is as follows:

Stages in development of a DWSPP		Comment
1	Prepare Drinking Water Source Protection Assessment	Assessment document prepared following catchment survey and preliminary information gathering from State and local government agency stakeholders.
2	Conduct stakeholder consultation	Advice sought from key stakeholders using the assessment as a tool for background information and discussion.
3	Prepare Draft DWSPP	Draft DWSPP developed taking into account input from stakeholders and any additional advice received.
4	Release Draft DWSPP for public comment	Draft DWSPP released for a six week public consultation period.

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Summary

The town of Preston Beach is a residential and tourism centre located approximately 115 km south of Perth in the Shire of Waroona. The town is situated between Lake Preston and the coast, largely enclosed by the Yalgorup National Park.

The Water Corporation currently supplies water to the town from two production bores (1/85 and 2/85) located in the town centre and one production bore (1/98) in the Johnston Road wellfield located approximately 7.5 km south east of town. An additional production bore is proposed in the Johnston Road wellfield.

The production bores in the town centre abstract water from a confined aquifer. The confined aquifer is not considered vulnerable to contamination from overlying land uses, but some land use activities (eg fuel storage) may pose a risk to water quality close to the wellheads.

The Johnston Road production bores abstract water from an unconfined alluvial formation. This water source is considered vulnerable to contamination from activities within the recharge area. Forestry activities are currently considered compatible with the proposed level of protection.

The Preston Beach Water Reserve should be proclaimed for the purpose of water source protection. The Reserve will consist of two areas, encompassing the Johnston Road and town wellfields. The main recharge area of the Johnston Road wellfield should be managed for Priority 1 source protection while the town wellfield should be managed for Priority 3 source protection. Activities within the Priority 3 source protection area should be managed to industry best practice.

Any development proposals within the proposed Water Reserve that may affect the quality of the water source should be referred to the Department of Water for comment.

A draft plan was released for consultation in December 2001. Submissions on the draft plan and the outcomes of discussions with key stakeholders, including the Water Corporation, Forest Products Commission, Department of Conservation and Land Management and the Department of Agriculture, were considered in the preparation of the final plan.

1. Introduction

1.1 Existing water supply system

The town of Preston Beach is a residential and tourism centre, located approximately 115 km south of Perth (see Figure 1). The Water Corporation supplies water to the town from two production bores (1/85 and 2/85) in the town centre and a single production bore (1/98) on Johnston Road (Appendix 2, Photo 1 and 2). The town wellfield is generally used in a duty/standby role, while the Johnston Road wellfield is the main production bore for the Preston Beach water supply.

The town wellfield is located within the administrative boundary of the Shire of Waroona, while the Johnston Road wellfield is located within the administrative boundaries of the Shires of Waroona and Harvey (Figure 1 and 2).

1.2 Allocation

Groundwater resource allocation is administered by the Department in accordance with the *Rights in Water and Irrigation (RIWI) Act, 1914*. Under the RIWI Act, the right to use and control groundwater is vested in the Crown. This Act requires licensing of groundwater abstraction within proclaimed Groundwater Areas.

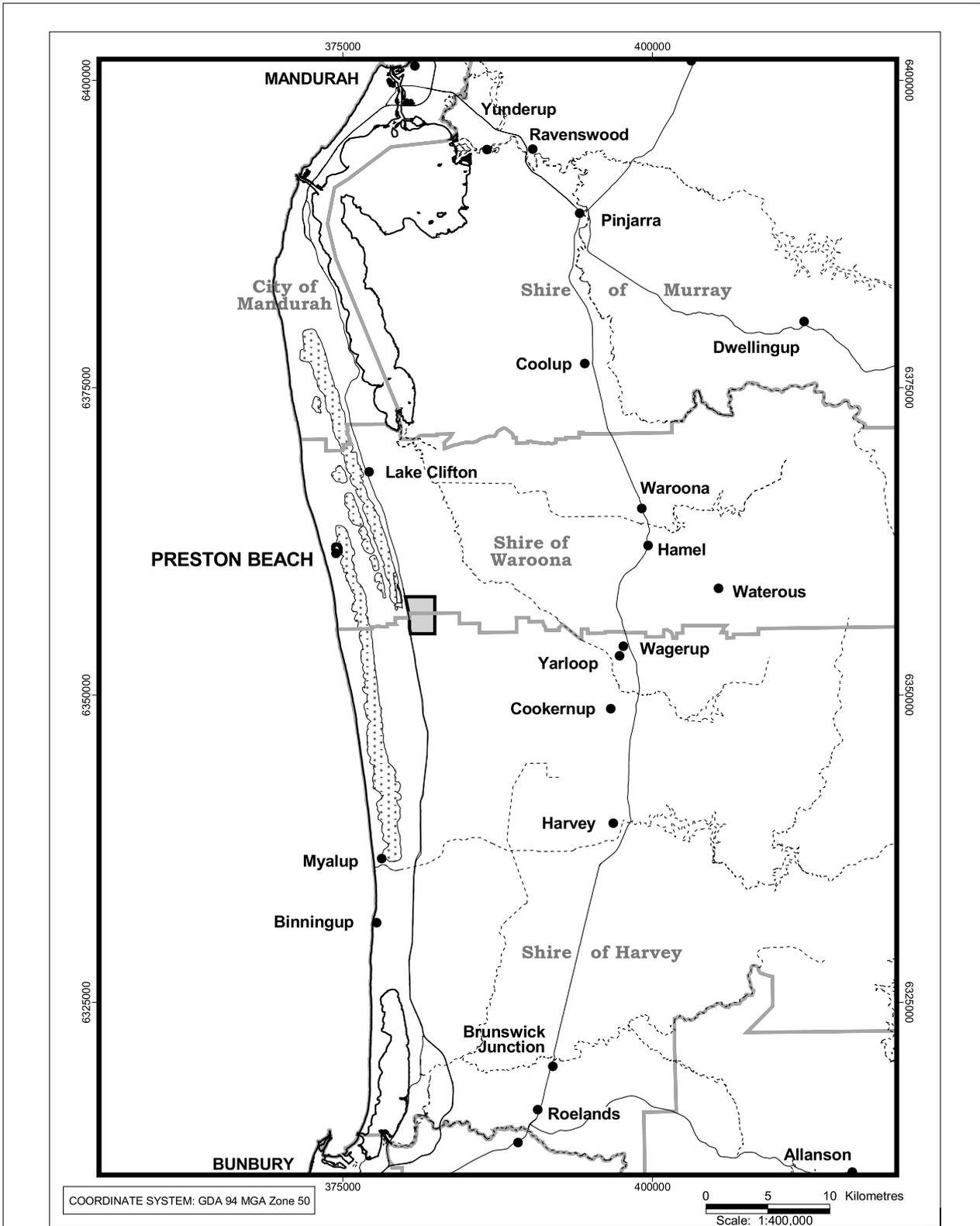
Preston Beach is within the South West Coastal Groundwater Area proclaimed under the RIWI Act. All groundwater abstraction in this Groundwater Area, other than that required for stock or domestic purposes, requires a licence from the Department of Water.

1.2.1 South West coastal groundwater area

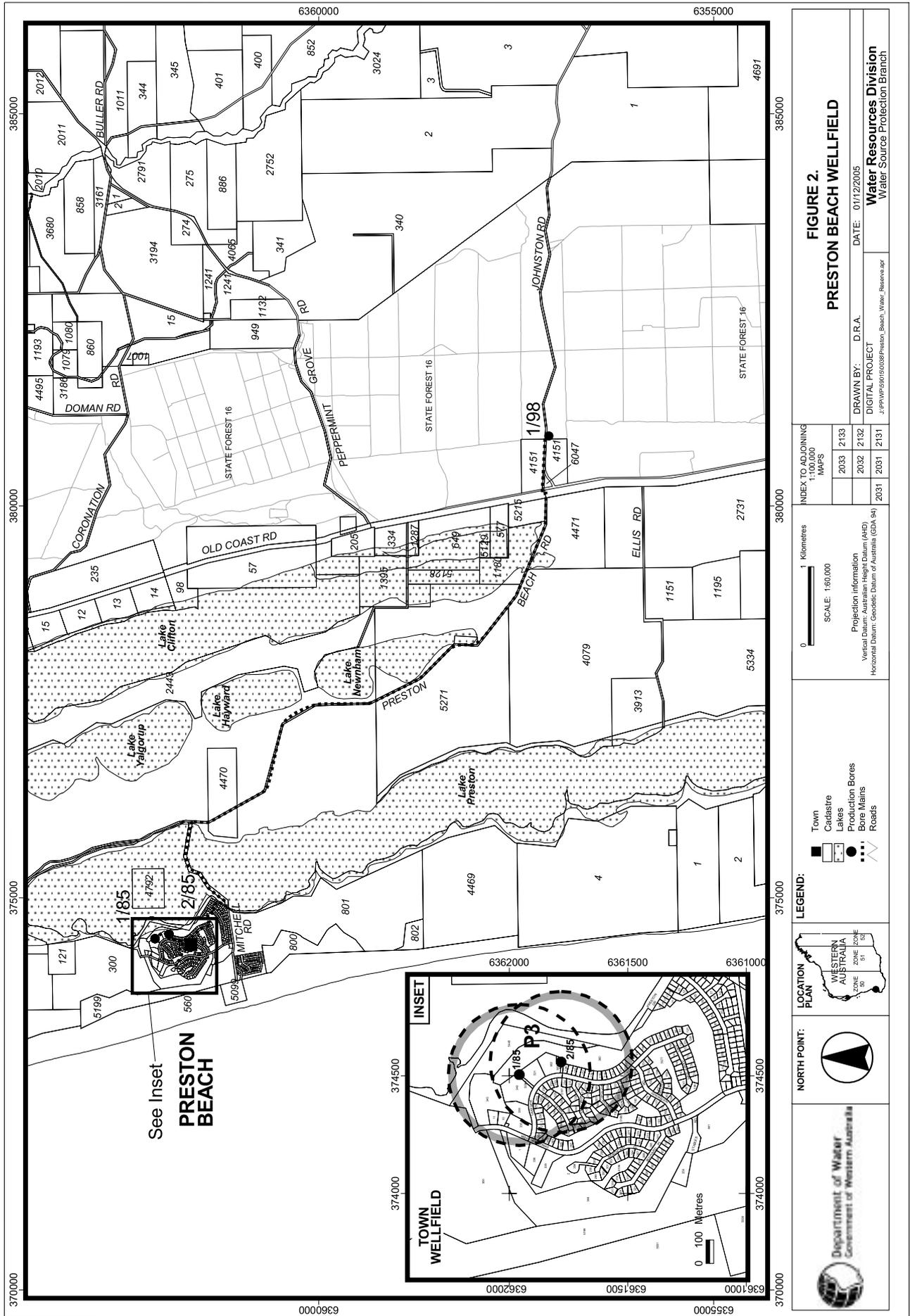
The South West Coastal Groundwater Area was proclaimed in 1977. The South West Coastal Groundwater Area Groundwater Management Review (1989) describes groundwater availability, existing use, water level monitoring and recommended strategies for allocating the resource.

1.2.2 Current allocation licence

The Water Corporation has a Groundwater Well Licence (no. 109495) to extract 20,000 kL per annum from the town wellfield and a licence (no. 97060) to extract 100,000 kL per annum from the Johnston Road wellfield. The Department issued these licences for the purpose of providing water for public potable water supply.



<p>Department of Water Government of Western Australia</p>	<p>LEGEND:</p> <ul style="list-style-type: none"> Lakes Hydrography Towns Roads Local Government Authorities Water Reserve Boundary 	<p>LOCATION PLAN</p>	<p>INDEX TO ADJOINING 1:100000 MAPS</p> <table border="1"> <tr> <td>2033</td> <td>2133</td> </tr> <tr> <td>2032</td> <td>2132</td> </tr> <tr> <td>1931</td> <td>2131</td> </tr> </table>		2033	2133	2032	2132	1931	2131	<p>FIGURE 1 PRESTON BEACH WATER RESERVE LOCALITY PLAN</p>	
			2033	2133								
2032	2132											
1931	2131											
		<p>DRAWN BY: D.R.A. DATE: 29/11/05</p>		<p>Water Resources Division Water Source Protection Branch</p>								



2 Future planning

2.1 Future water supply requirements

The current wellfield configuration is able to meet demand in Preston Beach. However, as the Preston Beach population will inevitably expand through natural growth and increasing migration, alternative water supply sources should be considered. Alternative water supply options to Preston Beach may include relocating the current wellfield; however, access to groundwater elsewhere on the coastal strip is restricted by water salinity, environmental restrictions and land access. Extending the Waroona pipeline and desalination are also options but they would be very costly. Until alternative sources are investigated and approved for their suitability and viability, protection of the currently used public drinking water source area is essential for provision of safe, good quality drinking water supply.

3 The catchment

3.1 Climate

The area has a Mediterranean type climate, characterised by warm, dry summers with cool and wet winters. The long-term average annual rainfall is approximately 870 mm, and varies from an average of 10 mm in January to 185 mm in June. Most rainfall occurs between May and September. Annual evaporation is between 1200 and 1600 mm and monthly evaporation varies from 10 mm in June to 300 mm in January. Rainfall generally exceeds evaporation between May and September.

3.2 Physiography

Preston Beach is situated on the Swan Coastal Plain. The Swan Coastal Plain consists of gently undulating sand and limestone hills, and alluvial plains. The area is characterised by a series of elongated lakes known as the Yalgorup lake system. These lakes are wetlands of international significance (Ramsar listed) and are located within the Yalgorup National Park.

The town and Johnston Road wellfields are in the surface water catchment and groundwater recharge area of Lake Preston, one of the lakes in the Yalgorup National Park (Appendix 2, Photo 3).

The town wellfield is situated on the Quindalup Dunes to the west of Lake Preston. The Johnston Road wellfield is situated on the Spearwood Dunes to the east of Lake Preston.

3.3 Hydrogeology

3.3.1 Town Wellfield Hydrogeology

The town wellfield draws groundwater from the confined Leederville aquifer. The aquifer is recharged by downward leakage from a superficial formation east of the wellfield and discharges to the ocean.

Locally, the Leederville formation is overlain by 35 m of Tamala limestone. The saturated thickness of the Leederville aquifer is approximately 80 m at the town wellfield.

Water is drawn from a confined aquifer and thus the water source it is not considered vulnerable to contamination from overlying land uses. However, some land use activities may pose a risk to water quality close to the wellheads (eg fuel storage).

Production bore 1/85 is screened between 84.5 and 97 m below ground level. Production bore 2/85 is screened between 62.5 and 71 m below ground level.

3.3.2 Johnson Road Wellfield Hydrogeology

The Johnston Road wellfield draws groundwater from a superficial aquifer. Locally, the superficial formation consists of 30 m of Tamala limestone. The saturated thickness of the superficial aquifer is 25 m in the Johnston Road area.

Recharge to the superficial aquifer is from rainfall infiltration and upward leakage from the Leederville aquifer in the area between the Johnston Road wellfield and Lake Preston. Discharge is to Lake Preston and through surface drainage.

The recharge area for the wellfield extends upgradient to the crest of the Yanget Mound, approximately 10 km to the north east. The aquifer is unconfined and considered vulnerable to contamination from overlying land uses. Surface water discharge is mainly to the Harvey River to the northeast of the wellfield. Bore 1/98 is screened between 16 and 37 m below ground level.

4 Water quality and treatment

4.1 Monitoring program

The Water Corporation through the Preston Beach Groundwater Scheme Water Resource Management Operation Strategy (Water Corporation, 2001) undertakes monitoring of production bores. The quality of water is currently assessed in accordance with the ADWG (1996). These guidelines are used in Western Australia by the Department of Health (DoH), the Department of Water and the Water Corporation to assess the quality of drinking water.

The water is monitored regularly for microbiological contamination, health-related chemicals and aesthetic chemicals and parameters. Bore pumpage is tested monthly, as are water levels, conductivity and temperature, and major components are tested annually.

DoH regulates water quality from the borefield through to the tap and also oversees monitoring to ensure water quality meets the ADWG.

4.2 Water quality

Microbiological contaminants

Thermotolerant coliform counts are used as an indicator of the degree of faecal contamination of the raw water from warm blooded animals. A count of less than 20 coliform forming units (cfu) per 100 ml is typically associated with low levels of faecal contamination and is used as a microbiological contamination benchmark (WHO, 1996).

Long-term testing, from January 2001, of raw water from Preston Beach treatment plant inlet revealed no positive thermotolerant coliform counts.

Salinity

A saltwater interface at the base of the superficial aquifer extends inland to the eastern side of Lake Preston. The Johnston Road wellfield is about 1.5 km inland from the saltwater interface and contains fresh groundwater over the full thickness of the

aquifer. Salinity at the Johnston Road wellfield was on average 550 mg/L Total Dissolved Salts (TDS) over the life of the bore.

There is potential for saltwater to enter the Leederville aquifer from the Yalgorup Lakes, or below, if the source is pumped at a high rate. The establishment of the superficial source at Johnston Road has reduced the demand on the Leederville formation.

The salinity of the bores since monitoring began in 1985 has ranged between 1000-1079 mg/L and 838-972 mg/L for bore 1/85 and 2/85 respectively.

Chemical parameters

Monitoring data of health-related chemicals indicated that concentrations for all parameters were below ADWG values, excluding Boron at Bore 1/85 where the ADWG, on average, was exceeded (0.41 mg/L (ADWG 0.3 mg/L)).

Monitoring of non-health related chemicals revealed a range of parameters that exceeded the ADWG. Unfiltered iron is approximately 1.2 mg/L at the Johnston Road wellfield. At the town wellfield, unfiltered iron ranges between 1.2 and 0.03 mg/L per litre. The ADWG guideline indicates that iron above 0.3 mg/L will exceed the taste threshold. Water treatment, however, is able to remove 99 per cent of iron. After treatment, the water contains approximately 0.03 mg/L. Water hardness exceeded the guidelines across the board ranging from 209.1 mg/L in bore 2/85 to 302.5 mg/L in bore 1/98. Turbidity also exceeded the guidelines in bore 1/98 reaching 400 NTU on occasion, and bore 1/85 reaching 11.3 NTU. Monitoring of colour, pH, manganese (unfiltered) and aluminium indicated all were below the guidelines, except aluminium at bore 1/98 where concentrations reached 0.39 mg/L.

4.3 Water Treatment

The raw water is dosed with Calgon™ to mitigate hardness levels, chlorine is then injected and the water is passed through an ODIS filter to remove precipitated iron and other solids. The treated water

is then stored in a 2,250 kL ground tank, reticulated and distributed to the community. It is recognised that although disinfection by chlorination generally removes microbiological contamination, treatment processes alone cannot be relied upon. This is why the ADWG 'catchment to consumer' multiple barrier approach is important for the provision of safe drinking water to consumers.

5. Land uses and contamination risk

5.1 Existing land use

Land use in the town includes urban residential areas and a golf course. Urban development, a golf resort and irrigation of the existing golf course are part of the proposed Preston Beach Development Plan (Photo 4 Appendix 2).

Land use near Johnston Road includes State Forest (proposed to become part of the Yalgorup National Park) and the McLarty Pine Plantation. This land is vested with the Conservation Commission of Western Australia and is managed by the Department of Conservation and Land Management. The Forest Products Commission is responsible for the management and marketing of the pine resource. Production bore 1/98 is established on the western edge of the McLarty Pine Plantation with State Forest to the west.

There is concern over current maintenance procedures of the pine plantation. Currently management procedures involve the maintenance of firebreaks using herbicides. Of the two chemicals used in this process, Atrazine does not appear on the list of compatible chemicals in PDWSA provided by the DoH in Public Service Circular (PSC) 88. Considering the proximity of the groundwater to the surface (within 16 m) and a soil profile consistent of sands and Tamala limestone, there is concern for leaching of the chemicals into groundwater.

Table 1 details the existing land uses in the proposed Water Reserve, identifies potential

water quality risks and suggests specific protection measures. The potential water quality hazards were identified and a management priority of High, Medium or Low assigned. The priority levels assigned to identified hazards were determined by assessing the likelihood and consequence of the source being contaminated, taking into account current preventive and management strategies for the catchment.

Strategies for managing the risks have been developed in line with ADWG recommendations. The discussion and recommended strategies balance the need to protect water quality now and in the long term with the rights of landholders to continue to utilise their land for approved purposes.

Contaminant threats include fertiliser and pesticide use, reticulated sewerage, septic systems and cumulative impacts from contaminated stormwater runoff.

5.2 Future land use

The Department of Agriculture has identified the Johnston Road part of the reserve as being of strategic importance for future horticulture. Horticulture is not a compatible land use in Priority 1 source protection areas. This classification will only be lifted provided that an alternative drinking water source for Preston Beach is identified, approved by Government and put in place. If this were to eventuate, this plan would be reviewed with the objective of maximising benefit to the State while ensuring a reliable, good quality water supply to the town of Preston Beach. Water availability and the protection of the Yalgorup lake system would also need to be considered in any assessment for horticulture in the long term.

The Water Reserve area and priority areas have been assessed according to current land uses. In the future, if any large-scale horticulture development were to proceed in the vicinity of the McLarty Pine Plantation, the Johnston Road part of the reserve would

need to be reassessed. It is likely that this part of the reserve would need to be expanded to ensure that it contained a large enough area to mitigate the migration of any nutrients or chemicals leaching through the soil and entering the drinking water source.

6 Catchment protection strategy

6.1 Protection objectives

The objective of this plan is to protect drinking water so as to provide a safe drinking water supply, while recognising current approved land use rights.

The proposed Priority 1 source protection area has the fundamental water quality objective of risk avoidance.

The proposed Priority 3 source protection area has the fundamental water quality objective of risk management. This plan generally recommends strategies to implement best management practices in Priority 3 areas to manage risks, rather than restricting land use options.

Table 1 outlines suggested risk management measures.

6.2 Proclaimed area

Proclaiming the Water Reserve ensures that the *Country Areas Water Supply Act (1947)* (CAWS Act) by-laws apply and allows the Department to manage potentially polluting land uses.

A Water Reserve should be declared around the Johnston Road wellfield. The proposed boundary is considered appropriate as:

- Water is drawn from the unconfined superficial aquifer, which is considered vulnerable to contamination;
- The area is of strategic importance for recharge to the aquifer;
- Pine plantation managers can easily define

where additional water quality protection measures are required; and

- The area allows for future expansion of the wellfield.

6.3 Priority classification areas

There is potential for some diffuse and point source contamination through agricultural activities in the capture zone for the Johnston Road wellfield. The capture zone extends to the crest of the Yanget mound, approximately 10 km to the northeast. However, it is not considered necessary to extend the Water Reserve beyond the proposed boundary, as current agricultural activities are sufficiently distant from the wellfield for effective mitigation of any groundwater contaminants.

The Johnston Road part of the Water Reserve should be managed for Priority 1 source protection, as the aquifer is considered vulnerable to contamination. Current forestry land use is generally considered to be of low risk to the water source and is compatible with the proposed level of protection. Future development should be assessed in line with the principle of risk avoidance.

A circular, 300 m radius Water Reserve should be declared around each town production bore.

These should be managed as Priority 3 source protection areas. This priority classification is appropriate as:

- Production bores draw from the confined Leederville aquifer, which is not considered vulnerable to contamination; and
- Existing land use is compatible.

Figure 3 displays the proposed Preston Beach Water Reserve.

6.4 Protection zones

In addition to priority classifications, wellhead protection zones (WHPZ) (a circular boundary encompassing the production bore) are defined to protect the water source from contamination in the immediate vicinity of

production bores. The CAWS Act by-laws define compatible land uses within the wellhead protection zones. A WHPZ of 500 m radius should be defined around the Johnston Road bore, a Priority 1 area, and a WHPZ of 300 m radius should be established around each of the bores in the town wellfield, a Priority 3 area. These zones do not extend outside the water reserves.

Special conditions apply within these zones as described in the CAWS Act by-laws. Land development and forestry practices within these areas should be carefully assessed to address immediate water quality risks. For example, the Department would have concerns with activities such as fuel and chemical storage, pesticide mixing, chemical maintenance of firebreaks and wastewater application to land in a WHPZ.

6.5 Land use planning

It is recognised under the State Planning Strategy (Western Australian Planning Commission, 2000) that the establishment of appropriate protection mechanisms in statutory land use planning processes is necessary to secure the long-term protection of water sources. As outlined in the Statement of Planning Policy No 2.7: Public Drinking Water Source Areas (Western Australian Planning Commission, 2003) it is appropriate that the Water Reserve and priority classification be recognised in relevant land planning strategies. These include the Town Planning Schemes for the Shires of Waroona and Harvey, the Peel Regional Scheme and the Greater Bunbury Regional Scheme.

6.6 Best management practices

The adoption of best management practices for land use activities is encouraged to help protect water quality. These are often in the form of an industry code of practice, environmental guideline or Water Quality Protection Note. They are usually developed in consultation with industry groups, producers and state government agencies.

The Forest Products Commission complies with the Code of Practice for Timber Harvesting in Western Australia, the associated Manual of Management guidelines for Timber Harvesting in Western Australia and the Code of Practice for Timber Plantations in Western Australia. These guidelines and codes are expected to be updated from time to time.

Education and awareness (eg signage and information material) is a key mechanism for water quality protection.

6.7 Water Quality Protection Notes

The Department has prepared Water Quality Protection Notes to provide information for land use activities that may impact on the quality of the State's water resources. These notes provide a basis for developing formal best management practice guidelines in consultation with key stakeholders.

They can be found on the Internet via the Department's homepage (<http://drinkingwater.water.wa.gov.au>> publications>guidelines>water quality protection notes).

6.8 Surveillance and by-law enforcement

The quality of public drinking water sources within country areas of the State is protected under the CAWS Act (1947). Declaration of these areas allows existing by-laws to be applied to protect water quality.

The Department considers by-law enforcement, through on-ground surveillance of land use activities in Water Reserves, as an important water quality protection mechanism. Surveillance is also important in raising the general level of awareness of the need to protect water quality.

Signs are erected in Water Reserves to educate the public and to advise of activities that are prohibited or regulated.

6.9 Emergency response

Escape of chemicals during unforeseen incidents and use of chemicals during emergency responses can result in groundwater contamination. The Shire of Harvey and Shire of Waroona Local Emergency Management Advisory Committees (LEMAC) through the Bunbury Emergency Management District should be familiar with the location and purpose of the Preston Beach Water Reserve. A locality plan should be provided to the Fire and Rescue Services headquarters for the Hazardous Materials Emergency Advisory Team (HAZMAT).

The Regional Manager, (South West) Department of Water should provide local advice to the HAZMAT Emergency Advisory Team during incidents in the proposed Preston Beach Water Reserve. The Water Corporation should have a broader advisory role to any HAZMAT incident in the Preston Beach Water Reserve.

Personnel who deal with WESTPLAN – HAZMAT (Western Australian Plan for Hazardous Materials) incidents within the area should be given ready access to a locality map of the proposed Water Reserve. These personnel should receive training to ensure an understanding of the potential impacts of spills on the groundwater resource.

Table 1 Potential sources of contamination within the Preston Beach Water Reserve
See figure 4 for location of potential sources of contamination.

Map Ref	Issue	Potential Water Quality Risks		Consideration for management	Recommended Protection Strategy
		Hazard	Management priority		
1	Preston beach 9-hole golf course	Fertiliser use	Low	<p>There is the possibility that fertiliser and pesticides may leach into the groundwater. However, as the aquifer is deep and confined the risk is considered low.</p> <p>Nutrient rich surface run off or groundwater could enter the RAMSAR listed Lake Clifton, causing eutrophication.</p> <p>The golf course is currently not irrigated</p> <p>Nutrients and pathogens could leach into the aquifers by using treated wastewater to irrigate the golf course. Risk is considered minimal due to the confined deep aquifer</p>	<p>Turf management should meet the <i>Environmental Guidelines for the Establishment and Maintenance of Turf and Grassed Areas</i>.</p> <p>Pesticide use should meet Health Department and Water and Rivers Commission standards for Public Drinking Water Source Areas. Water and Rivers Commission policy is outlined in <i>Statewide Policy No. 2 – Pesticide use in Public Drinking Water Source Areas</i>.</p> <p>Treated sewerage effluent should meet Health Department, Department of Water, and Department of Environment standards for irrigation.</p> <p>Wastewater application to land should not be permitted within Wellhead Protection Zones.</p> <p>A Nutrient and Irrigation Management Plan should be developed and implemented if the golf course is irrigated in the future.</p>
		Pesticide use	Low		
		Potential for irrigation of golf course with storm water and secondary treated wastewater in the future.	Low		
2	Proposed Preston Beach Golf Resort	Reticulated sewerage	Low	<p>Environmental Impact Assessment required by the Department of Water.</p> <p>Potential for leaching of contaminants into the aquifer. Because the majority of the resort is outside the water reserve, the aquifer is confined and deep, risk is considered minimal.</p>	<p>Pesticide use should meet Health Department and Water and Rivers Commission standards for Public Drinking Water Source Areas. Water and Rivers Commission policy is outlined in <i>Statewide Policy No. 2 – Pesticide use in Public Drinking Water Source Areas</i>.</p> <p>Stormwater management should be consistent with <i>A Manual for Managing Urban Stormwater Quality in Western Australia</i>.</p>
		Fertiliser use	Low		
		Pesticide use	Low		
		Car parks	Low		

Map Ref	Issue	Potential Water Quality Risks		Consideration for management	Recommended Protection Strategy
		Hazard	Management priority		
N/A	Urban Land uses Existing and proposed residential development	Existing septic systems and reticulated sewerage.	Low	There is a potential risk of leaching chemicals and nutrients into the aquifer and Lake Clifton. However, risk is small from domestic uses.	Install signs around the boundary of the Water Reserve to promote community awareness. Signs should include an emergency contact number. Minimise pesticide and fertiliser use within the water reserve. Ensure septic tanks are managed appropriately.
		Domestic fertiliser use	Low		
		Domestic pesticide use	Low		
3	Johnston Road within 500 metres of bore 1/98. Road trains and other vehicles use this and the nearby Old Coast Road as a primary transport route.	Road accidents or spills of fuels or other chemicals, and cumulative impacts from contaminated stormwater runoff.	Medium	Potential for groundwater contamination by hydrocarbons and other chemicals. Risk here is exacerbated by the shallow groundwater and sandy soil profile. The road is well maintained, and the WESTPLAN – HAZMAT emergency response plan for major spill events is in place.	Maintain emergency response plan. Ensure awareness of the proposed Water Reserve and keep relevant personnel informed. Install signs to define the Water Reserve boundary. Signs should include an emergency contact number.
4	McLarty Pine Plantation	Use of fertilisers within the Water Reserve.	Low	The shallow groundwater and sandy soil profile increases the risk of groundwater contamination from these chemicals. Pesticides are used in high concentrations to maintain the firebreaks within the Water Reserve; this poses a unacceptable risk to water quality.	Forest Products Commission and Department of Conservation and Land Management operators adhere to Code of Practice for Timber Harvesting in Western Australia. The Forest Products Commission soil tests indicate that soil nutrients in the McLarty Pine Plantation are close to levels found in natural bushland. Long-term monitoring of the Lake Clifton monitoring bore line (C6, C7 and C8 along Johnston Road) has not indicated groundwater contamination. Pesticides and hydrocarbons were not tested during monitoring. It is recommended that an in-depth sampling program for pesticide residuals in groundwater and soil occur to determine the impact, if any, on groundwater. Furthermore, only those pesticides listed on PSC-88 should be used within the Water Reserve.
		General use of pesticides within the Water Reserve.	Low		
		Use of pesticides for firebreak maintenance.	Medium		

Refer to the ADWG for further information about water quality hazards, available at www.health.gov.au/nhmrc/publications/

7 Recommendations

1. The proposed Preston Beach Water Reserve should be proclaimed under the *Country Areas Water Supply Act, 1947* (Department of Water).
2. Land planning strategies, including the Peel – Greater Bunbury Region Scheme and the Town Planning Schemes for the Shires of Waroona and Harvey should incorporate the management principles outlined in this plan and reflect the identified Water Reserve boundary, the Priority 1 and 3 classifications and well head protection zones (DPI/WAPC and LGA).
3. All development proposals in the Water Reserve that are likely to impact on water quality that are not consistent with the Department's published Policy, Guidelines, Water Quality Protection Notes or other documents should be referred to the Department of Water for advice (all stakeholders).
4. Signs should be erected along the boundaries of the proposed Water Reserve to define the location and promote public awareness of the need to protect water quality. Signs should include an emergency contact phone number (Water Corporation).
5. Incidents covered by WESTPLAN – HAZMAT in the Preston Beach Water Reserve should be addressed through the following measures (Department of Water):
 - The Shire of Waroona and Shire of Harvey Local Emergency Management Advisory Committees (through the Bunbury Emergency Management District) become familiar with the location and purpose of the proposed Preston Beach Water Reserve.
 - The locality plan for the Proposed Preston Beach Water Reserve become provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team.
 - The Regional Manager, Department of Water provides local advice to the HAZMAT Emergency Advisory Team during incidents in the proposed Preston Beach Water Reserve.
6. The Water Corporation provides a broader advisory role during incidents in the proposed Preston Beach Water Reserve.
7. Personnel dealing with WESTPLAN – HAZMAT incidents in the area are given ready access to a locality map of the Water Reserve and training to understand the potential impacts of spills on the surface water resource
6. A surveillance program should be implemented to identify any incompatible land uses or potential contaminant threats within the Water Reserve. Implementation of surveillance and by-law enforcement should be delegated to the Water Corporation as the Government licensed water service provider for Preston Beach (Water Corporation).
7. The monitoring program for the production bores should be reviewed to address the water quality risks identified in this plan. Monitoring for pesticides should be included on the monitoring program (Water Corporation).
8. Pine plantation management and future harvesting plans and operational manuals should be consistent with water source protection objectives. Pesticide use should meet Health Department and Water and Rivers Commission standards for Public Drinking Water Source Areas (Forest Products Commission).
9. The practice of maintaining firebreaks in PDWSA with chemicals should be reviewed and reported to the Department (Forest Products Commission).
10. The strategies detailed in Table 1. Land use, potential water quality risks and recommended strategies should be adopted and implemented (all stakeholders).
11. A full review of this protection plan should be undertaken after five years (Department of Water).

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Glossary

Allocation	The quantity of surface water permitted to be abstracted by a licence, usually specified in kilolitres/year (kL/a).
Augment	To increase the available water within a storage dam by pumping back water from a secondary reservoir/storage dam.
Catchment	The area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater.
CFU	Coliform forming units
Diffuse source pollution	Pollution originating from a widespread area, eg urban stormwater runoff, agricultural runoff.
Effluent	The liquid, solid or gaseous wastes discharged by a process, treated or untreated.
kL	Kilolitres (1000 litres)
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.
m	Metres
mm	Millimetres (0.001 metres)
m AHD	Australian Height Datum. Height in metres above Mean Sea Level. +0.026 m at Fremantle.
Mg/L	Milligrams per litre (0.001 grams per litre)
mL	Millilitres (0.001 litres)
NTU	Nephelometric turbidity units
Nutrient load	The amount of nutrient reaching the waterway over a given time (usually per year) from its catchment area.
Nutrients	Minerals dissolved in water, particularly inorganic compounds of nitrogen (nitrate and ammonia) and phosphorus (phosphate) which provide nutrition (food) for plant growth. Total nutrient levels include the inorganic forms of an element plus any bound in organic molecules.
Pesticides	Collective name for a variety of insecticides, fungicides, herbicides, algicides, fumigants and rodenticides used to kill organisms.
Point source pollution	Pollution originating from a specific localised source, eg sewage or effluent discharge, industrial waste discharge.

Pollution	Water pollution occurs when waste products or other substances, eg 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.
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> .
Runoff	Water that flows over the surface from a catchment area, including streams.
Reservoir Protection Zone (RPZ)	<ul style="list-style-type: none"> a) That part of a catchment area which lies upstream of a reservoir and is within two kilometres of the top water level; b) That area adjacent to a reservoir, the extent of which is identified on plans; and c) Includes the reservoir.
Reservoir	A reservoir, dam, tank, pond or lake that forms part of any public water supply works.
Scheme supply	Water diverted from a source (or sources) by a water authority or private company and supplied via a distribution network to customers for urban, industrial or irrigation use.
Storage reservoir	A major reservoir of water created in a river valley by building a dam.
Stormwater	Rainwater which has run off the ground surface, roads, paved areas etc. and is usually carried away by drains.
Treatment	Application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes including drinking and discharge to the environment.
Underground Water Pollution Control Area (UWPCA)	Any area defined under the <i>Metropolitan Water Supply Sewerage and Drainage Act 1909</i> , in which restrictions are put on activities which may pollute the groundwater
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.

Appendix 1 – Water Quality

The Water Corporation has monitored the raw (source) water quality from the Preston Beach bores 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:

- Health related characteristics
- Microbiological Contaminants
- Health Related Chemicals
- Aesthetic characteristics – (Non-Health Related)

Following is data representative of the quality of raw water from the Preston Beach sources. In the absence of specific guidelines for raw water quality, the results have been compared with ADWG values set for drinking water. Results that exceed 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 that would be distributed to the public. Following treatment, the drinking water supplied to the IWS and GSTW Schemes will comply with ADWG microbiological, health and aesthetic requirements. For more information on the quality of drinking water supplied refer to the most recent Water Corporation Drinking Water Quality Annual Report at www.watercorporation.com.au/dwq/index.cfm

Health Related Characteristics – Preston Beach Raw Water

- Microbiological Contaminants

Thermotolerant coliform counts are used as an indicator of the degree of faecal contamination of the raw water from warm-blooded animals. A count less than 20 colony forming units (cfu) per 100 mL is typically associated with low levels of faecal contamination and is used as a microbiological contamination benchmark (WHO, 1996).

Microbiological testing of the raw water from the Preston Beach water treatment plant inlet and outlet has been conducted on a monthly basis since January 2001. Since then Preston Beach water was sampled 63 times from the water treatment plant inlet (raw water) and 14 times from the outlet (treated water). No positive thermotolerant coliform counts were recorded.

- Health Related Chemicals

The raw water from Preston Beach bores is analysed for health-related chemicals. Health-related chemicals include inorganics, heavy metals, industrial hydrocarbons and pesticides. Health-related water quality parameters that have been measured at detectable levels in the sources since September 1985 are

summarised in the following table. Monitoring is ongoing. The water quality parameters that have on occasion exceeded the ADWG aesthetic guideline for supplied drinking water are in bold type.

Parameter	Range of monitored values			1996 ADWG Health Guideline Value [^]
	Min-Max Median			
	Bore 1/85	Bore 1/98	Bore 2/85	
Metals				
Arsenic (mg/L)	ND – ND ND	ND*	ND – ND ND	0.007
Barium (mg/L)	0.065 - 0.15 0.14	0.05 - 0.75 0.0625	0.021 - 0.17 0.08	0.7
Boron (mg/L)	0.4 - 0.42 0.41	0.03*	0.25 - 0.28 0.265	0.3
Inorganic				
Fluoride (mg/L)	0.3 - 0.4 0.35	NT	0.2 - 0.3 0.25	1.5
Nitrate + Nitrite (as N) (mg/L)	ND - 0.06 ND	0.35 - 1.4 0.995	ND - ND ND	11.3

[^]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.

ND is Not Detected

NT is Not Tested

*One test result only

The water from Preston Beach bore 1/98 complies with ADWG health guidelines with the exception of an isolated elevated Barium level.

Aesthetic Characteristics – Preston Beach Raw Water

Aesthetic water quality analyses for raw water from Preston Beach are summarised in the following table. The values are taken from ongoing raw water monitoring up to September 2005.

The water quality parameters that have on occasion exceeded the ADWG aesthetic guideline for supplied drinking water are in bold type.

Parameter	Range of monitored values			1996 AWDG Health Guideline Value [^]
	Min-Max			
	Median			
	Bore 1/85	Bore 1/98	Bore 2/85	
Salinity (mg/L) (TFSS less CO ₂)	1000 – 1079 1033	511 – 280 544	838 – 972 917	1 000
Hardness (mg/L) (CaCO ₃)	169.8 - 213.4 190	291 – 326 302.5	188.1 – 220 209.1	200
Turbidity (NTU)	0.2 - 11.3 1.2	0.4 – 400 8.5	0.2 – 99 1.4	5
pH	7.18 - 8.5 7.62	7.05 - 7.27 7.13	7.3 - 7.85 7.57	6.5-8.5
Colour (TCU)	ND – 5 1	1 – 13 6	ND – 4 2	15
Iron (mg/L) (unfiltered)	0.07 - 1.2 0.24	0.1 - 91 1.2	0.11 - 15.7 0.3	0.3
Manganese (mg/L) (unfiltered)	ND - 0.06 0.042	ND - 0.18 0.017	ND - 0.07 0.05	0.1
Aluminium (mg/L) (unfiltered)	ND - 0.1 ND	ND - 0.39 ND	ND - 0.2 ND	0.2

[^]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.

ND is Not Detected

NT is Not Tested

*One test result only

The raw water from Preston Beach bore 1/85 complies with ADWG aesthetic guidelines with the exception of elevated salinity and isolated occurrences of increased hardness, turbidity and iron (unfiltered) levels. The raw water from bore 1/98 has exceeded the ADWG aesthetic guidelines in hardness, turbidity, iron (unfiltered) and aluminium (unfiltered). The raw water from Bore 2/85 has elevated hardness and iron (unfiltered) levels.

Appendix 2 – Photos



Photo 1. Production bore 2/85 with Preston Beach Golf Course in the background.



Photo 2. Production bore 1/98 with the McLarty Pine Plantation in the background.



Photo 3. Lake Preston.



Photo 4. Preston Beach Golf Course.

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