BUNBURY WATER RESERVE

DRAFT BUNBURY – BUSSELTON WATER SOURCE PROTECTION PLAN

Bunbury, Busselton, Capel, Dalyellup,

Australind, Boyanup, Dardanup,

Peppermint Grove and Eaton

Town Water Supplies

Water Resource Protection Series
WRP 43

August, 2001

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Water and Rivers Commission
Policy and Planning Division

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Foreword

Water Source Protection Plans

Water Source Protection Plans establish the level of protection required in Water Reserves. Catchment protection of water sources is considered a fundamental part of ensuring the provision of a safe drinking water supply.

Water Source Protection Plans identify sources of contamination that should be investigated and set out programs for management of the resource. Water Source Protection Plans are developed in consultation with affected landowners and industry groups and relevant government agencies.

Proclaiming Water Reserves and Catchment Areas under the *Country Areas Water Supply Act 1947* protects the quality of water sources in country Western Australia. The Act's by-laws enable the Water and Rivers Commission to control potentially polluting activities, to regulate land use, inspect premises and to take steps to prevent or clean up pollution.

The Water and Rivers Commission aims to work pro-actively with planning agencies to incorporate water protection in the land planning process. Decisions on land use zoning and subdivision applications have a significant impact on the protection of water sources. The Commission supports the amendment of Town Planning Schemes and Development Strategies that reflect land use compatible with Water Source Protection Plans.

This Water Source Protection Plan provides a basis for establishing compatible land uses within the Bunbury Water Reserve and is a mechanism for practical implementation of the Commission's protection strategies. Local government decision-makers, State planning authorities and operational staff are encouraged to recognise this document as a basis for ensuring the long term protection of these water resources for generations to come.

Water quality protection framework

The Water and Rivers Commission is responsible for managing and protecting Western Australia's water resources. The Commission has developed policies for the protection of public drinking water source areas (PDWSAs) that include three levels of priority classification.

Priority 1 (P1) source protection areas are defined to ensure that there is no degradation of the water source. P1 areas are declared over land where the provision of the highest quality public drinking water is the prime beneficial land use. P1 areas would typically include land under Crown ownership. P1 areas are managed in accordance with the principle of risk avoidance and so land development is generally not permitted.

Priority 2 (P2) source protection areas are defined to ensure that there is no increased risk of pollution to the water source. P2 areas are declared over land where low intensity development (such as rural) already exists. Protection of public water supply sources is a high priority in these areas. P2 areas are managed in accordance with the principle of risk minimisation and so some conditional development is allowed.

Priority 3 (P3) source protection areas are defined to minimise the risk of pollution to the water source. P3 areas are declared over land where water supply sources need to co-exist with other land uses such as residential, commercial and light industrial developments. Protection of P3 areas is achieved through management guidelines rather than restrictions on land use. If the water source does become contaminated, then water may need to be treated or an alternative water source found.

In addition to priority classifications, wellhead protection zones are defined to protect the water source from contamination in the immediate vicinity of production bores. Wellhead protection zones are usually circular, with a radius of 500 metres in P1 areas and 300 metres in P2 and P3 areas. These zones do not extend outside water reserves and special conditions apply.

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Summary

This Water Source Protection Plan reviews the requirements for water quality protection of the sources used to supply the coastal towns between Australind and Busselton.

The City of Bunbury is located approximately 160 kilometres south of Perth, and the Town of Busselton is located a further 50 kilometres south. There are nine water supply schemes in this area. All use groundwater sources.

Most of the public water supply wellfields abstract from the region's confined aquifers. Busselton, Capel, Eaton, Dardanup, Boyanup, Peppermint Grove and Australind have a confined aquifer water source and are not considered vulnerable to contamination. The report will therefore briefly look at these public water supplies.

Bunbury and Dalyellup source water from the Yarragadee aquifer, which is unconfined in the locality of the wellfields. The source is potentially vulnerable to contamination from nearby land uses. The risk of contamination is lowest for bores screened deeper in the aquifer. Current and historical land uses in that area have the potential to contaminate the water source, although there are no monitoring results to suggest that contamination has occurred to date.

This draft plan recommends a Water Reserve be gazetted to protect the Bunbury and Dalyellup water source. The protection boundaries have been defined on the basis of the local hydrogeology and hydrology, which determines the potential for contamination. The proposed Water Reserve also allows for future expansion of the wellfield.

It is recommended that the Water Reserve be classified for Priority 3 source protection, on the basis of the nature of the water source and existing land uses.

Development proposals with the potential to cause groundwater contamination within the proposed Bunbury Water Reserve should be referred to the Water and Rivers Commission for assessment and advice.

This draft plan has been prepared in consultation with the City of Bunbury, Shires of Capel and Busselton, Water Corporation, AqWest, Ministry for Planning, Busselton Water Board, Department of Environmental Protection and landowners.

This draft plan is now released for public consultation for a period of eight weeks. You are encouraged to submit comments to:

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The comments received will be considered in the preparation of the final plan.

1. Introduction

This Water Source Protection Plan reviews the water quality protection requirements for the sources used to supply drinking water between Australind and Busselton (refer to **Figure 1**).

The City of Bunbury, the largest population centre in the study area, is located approximately 160 km south of Perth. Dalyellup, a major subdivision 7 km south of Bunbury, is situated within the Shire of Capel.

The Town of Busselton, 210 km south of Perth, is the second largest population centre in the study area and is the most southern scheme investigated.

Capel and Peppermint Grove Beach are situated between Busselton and Bunbury. The townships of Australind and Eaton are located north of Bunbury. Dardanup and Boyanup are situated southeast of Bunbury.

The public drinking water supply for all these schemes is sourced from groundwater.

1.1 Existing water supply system

Six independent water supply schemes operate in the study area.

Aqwest supplies water to the City of Bunbury. The Busselton Water Board supplies water to Busselton. The Water Corporation supplies water to Australind, Eaton, Dalyellup, Capel, Boyanup, Dardanup and Peppermint Beach.

General details of each public water supply wellfield are listed in **Table 1**.

Table 1. Public water supply wellfield details

Scheme	No. of bores	Aquifer	Provider
Bunbury	13	Yarragadee	AqWest
Busselton	5 3	Leederville Yarragadee	Busselton Water Board
Australind[1]	3 1	Leederville Yarragadee	Water Corporation
Eaton[1]	2	Yarragadee	Water Corporation
Dalyellup	1	Yarragadee	Water Corporation
Capel	2	Yarragadee	Water Corporation
Peppermint Grove Beach	2	Yarragadee	Water Corporation
Dardanup	2	Leederville	Water Corporation
Boyanup	2	Yarragadee	Water Corporation

1. The schemes are connected to increase management flexibility.

Other major uses of groundwater in the region are for the mining industry, horticulture, industrial processing and irrigation of parks and gardens.

1.2 Existing water source protection

No public drinking water source areas have been previously proclaimed in the area.

1.3 Future water supply

The Bunbury water supply scheme is designed to be able to meet predicted demand to at least 2002. Efficiency improvements at the water treatment plants will meet initial increased water requirements, but new production bores will be required to be drilled east of Bunbury when the city's growth requires the water supply be extended in that direction. Drilling these bores has been programmed for 2003-04, but may be postponed subject to demand.

The Busselton water supply scheme will require additional production capacity by 2002. An additional production bore will be drilled west of the town, approximately 1 km east of the Busselton Fault, in 2002. Further bores will be located east of Busselton. Long term expansion of the wellfield will involve a second line of bores drilled south of the town site.

The Peppermint Grove Beach water supply scheme will be able to meet predicted demand to at least 2001. The current bores are nearing the end of their service life. New bores will be developed on the flats east of the current treatment plant when required. The treatment plant will also be moved east of the town site.

The Capel water supply scheme will be able to meet predicted demand to at least 2006. Increased water demand will be met by installing higher capacity pumps to the existing bores.

The Australind – Eaton water supply scheme will be able to meet predicted demand to at least 2001. Initial increases in source requirements at Australind will be met by developing a new bore in the Leederville aquifer north of the treatment plant. Source capacity at Eaton will be increased by redrilling the existing bores, which are reaching the end of their design life. New bores will be constructed if redrilling proves unsuccessful.

The Dalyellup water supply scheme will be able to meet predicted demand for at least several years. Initial increases in demand will be met by increasing the pump capacity of the existing bore. Further increases will be met by developing two bores further south.

Future source planning for Dardanup and Boyanup are not required at this time.

1.4 Water resource allocation

Groundwater resource utilisation and conservation in Western Australian country areas is administered by the Water and Rivers Commission in accordance with the *Rights in Water and Irrigation Act, 1914*. This Act requires the compulsory licensing of all artesian bores throughout Western Australia. In addition, non-artesian bores require licensing in specific areas, proclaimed under the Act as Groundwater Areas.

1.4.1 Bunbury Groundwater Area

The Bunbury Groundwater Area was proclaimed in 1975. The area is divided into seven sub areas, based on groundwater flow systems, to manage the quantity of groundwater resources. Public drinking supply wellfields are located in the South Bunbury, East Bunbury, Stratham, Gelorup, Eaton, Dardanup, Boyanup and Australind sub areas (refer to **Figure 2**).

The Commission continues to renegotiate allocation limits in line with best management practices of each water service provider. A review will shortly be completed for Aqwest, Busselton Water Board and Water Corporation.

The Water Authority of WA published the Bunbury Groundwater Area Management Plan in 1994. The plan summarised the groundwater resource characteristics and abstraction details of the Bunbury Groundwater Area, and developed groundwater management policies for each of the management subareas.

1.4.2 Busselton - Capel Groundwater Area

The Busselton - Capel Groundwater Area was proclaimed in 1984. The area is divided into nine sub areas, based on groundwater flow systems, to manage the quantity of groundwater resources. Public drinking supply wellfields are located in the Capel – Ludlow and Busselton – Chapman Hill sub areas.

The Water Authority of WA published the Busselton Capel Groundwater Area Management Plan in 1995. The plan summarised the groundwater resource characteristics and abstraction details of the Busselton Groundwater Area, and developed groundwater management policies for each of the management sub-areas. These included dividing the Leederville Formation into upper and lower units for management purposes.

A review of the Busselton Capel Groundwater Area Management Plan is expected to begin during the 2002-03 financial year. The review will refine the environmental water requirements for groundwater dependent ecosystems within the Groundwater Area. Environmental water provisions will be refined on the basis of those outcomes.

1.4.3 Current allocation licences

Abstraction details for each water utility are detailed in **Table 2** below.

Table 2. Allocation licences for public water supply

Water Utility	Licensed Allocation (ML/per annum)	Sub Area
Aqwest	18200	South Bunbury East Bunbury Dardanup Eaton
Busselton Water Board	9450	Busselton–Chapman Hill
Water Corporation:		
Australind	1700	Australind
Eaton	1100	Eaton
Dalyellup	350	Gelorup
Capel	400	Capel-Ludlow
Peppermint Beach	60	Capel-Ludlow
Dardanup	75	Dardanup
Boyanup	325	Boyanup

2. Physiography

The Swan Coastal Plain in the Bunbury - Busselton region is generally flat to gently undulating sand plain. Hills are generally lower than 30 metres AHD. Numerous shallow drainage lines cross the plain, draining to wetlands and the sea. There are many extensive wetland areas, which are hydraulically connected to the superficial groundwater aquifer.

The Swan Costal Plain terminates at the Darling Scarp to the east, and the Whicher Scarp to the south.

3. Climate

The climate of the region is described as Mediterranean, with warm dry summers and cool wet winters. The long term average annual rainfall for Bunbury is 861 millimetres (Water Authority of WA, 1994). The long term average annual rainfall for Busselton is 825 millimetres. Rainfall increases to the south, to about 1200 millimetres on the Blackwood Plateau. Rainfall peaks between June and August (Water Authority of WA, 1995).

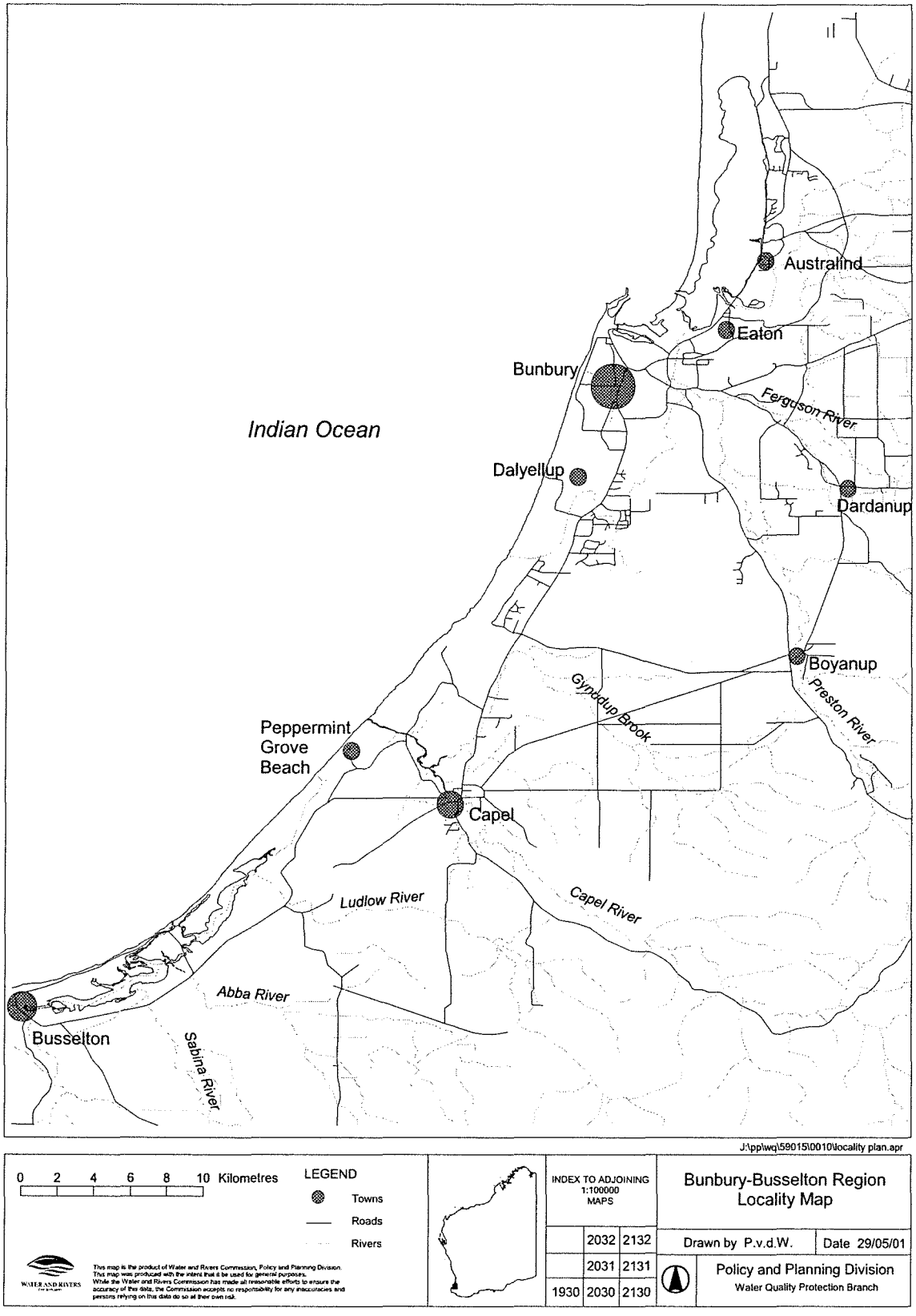

Figure 1. Bunbury Busselton region locality map

4. Hydrogeology

The formations in the Bunbury - Busselton region of the Perth Basin are, from the surface: superficial formations, Leederville Formation, Yarragadee Formation, and the Cockleshell Gully Formation. The Bunbury Basalt unconformably separates the Leederville Formation and the deeper Yarragadee Formation south of Bunbury (refer to **Figure 2**).

The superficial formations are generally thin, and are up to 20 metres thick in some areas. They are predominantly sands and form an unconfined aquifer that is recharged by direct infiltration of rainfall.

The Leederville Formation consists of interbedded sand and shale. Its thickness in the Bunbury Trough averages between 150 and 200 metres. The formation contains confined groundwater, and acts to confine the deeper Yarragadee Formation. The Leederville aquifer is absent from an area extending approximately 25 kilometres south of Bunbury (refer to **Figure 2**).

The Yarragadee Formation consists of weakly consolidated sandstone, siltstone and shale. Sandstone is the dominant lithology, comprising about 70% of the formation. The formation's thickness ranges from 600 metres to 1 200 metres, and extends to depths of up to 1 500 metres. The Yarragadee aquifer is confined, except for the area south of Bunbury where the Leederville Formation and Bunbury Basalt are absent (refer to **Figure 2**). The Yarragadee aquifer is in hydraulic connection with the superficial aquifer in this area.

The Cockleshell Gully Formation is about 1 500 metres thick and is composed of interbedded sandstone and grey shale. It is the oldest unit with groundwater potential. The aquifers in this formation are confined.

The Leederville Formation is recharged by direct infiltration of rainfall on the Blackwood Plateau, where the formation outcrops.

The Yarragadee Formation is also recharged by direct infiltration of rainfall where the formation outcrops on the Blackwood Plateau. This is considered to be in the Nannup area (Water Authority of WA, 1995). The aquifer is also recharged by leakage from the overlying Leederville aquifer south of the Whicher Scarp. Even over large areas the leakage rates are likely to be low however, due to the extensive clay unit at the bottom of the Leederville Formation. Some recharge also occurs through the superficial formations between Bunbury and Capel.

The regional groundwater flow in the Leederville and Yarragadee aquifers is to the northeast near Bunbury. Carbon dating indicates that water in the Yarragadee aquifer is in the order of 40 000 years old (Thorpe, 1994).

5. Water quality

Most of the production bores in this region produce water of high colour, turbidity, aluminium, iron and/or manganese, necessitating treatment prior to distribution.

The water quality in the Leederville and Yarragadee aquifers generally meets raw water quality standards. Areas of high salinity within the aquifers necessitate careful planning of wellfields. Water quality monitoring has not detected any adverse trends in water quality that would indicate impacts from land use.

5.1 Water treatment

Raw groundwater from the production bores is treated by aeration, precipitation and filtration to reduce iron, manganese and hardness.

In Bunbury, chlorination is used to precipitate iron and manganese prior to filtration. This also provides residual chlorine for disinfection.

The Water Corporation schemes also precipitate iron and manganese by chlorination prior to filtration. This provides residual chlorine for disinfection. Clarification is also used at Australind to reduce colour.

The Busselton town water supply is treated by aeration and filtration to remove iron and manganese. Ultra-violet radiation is used for disinfection after treatment (Busselton Water Board, 1999).

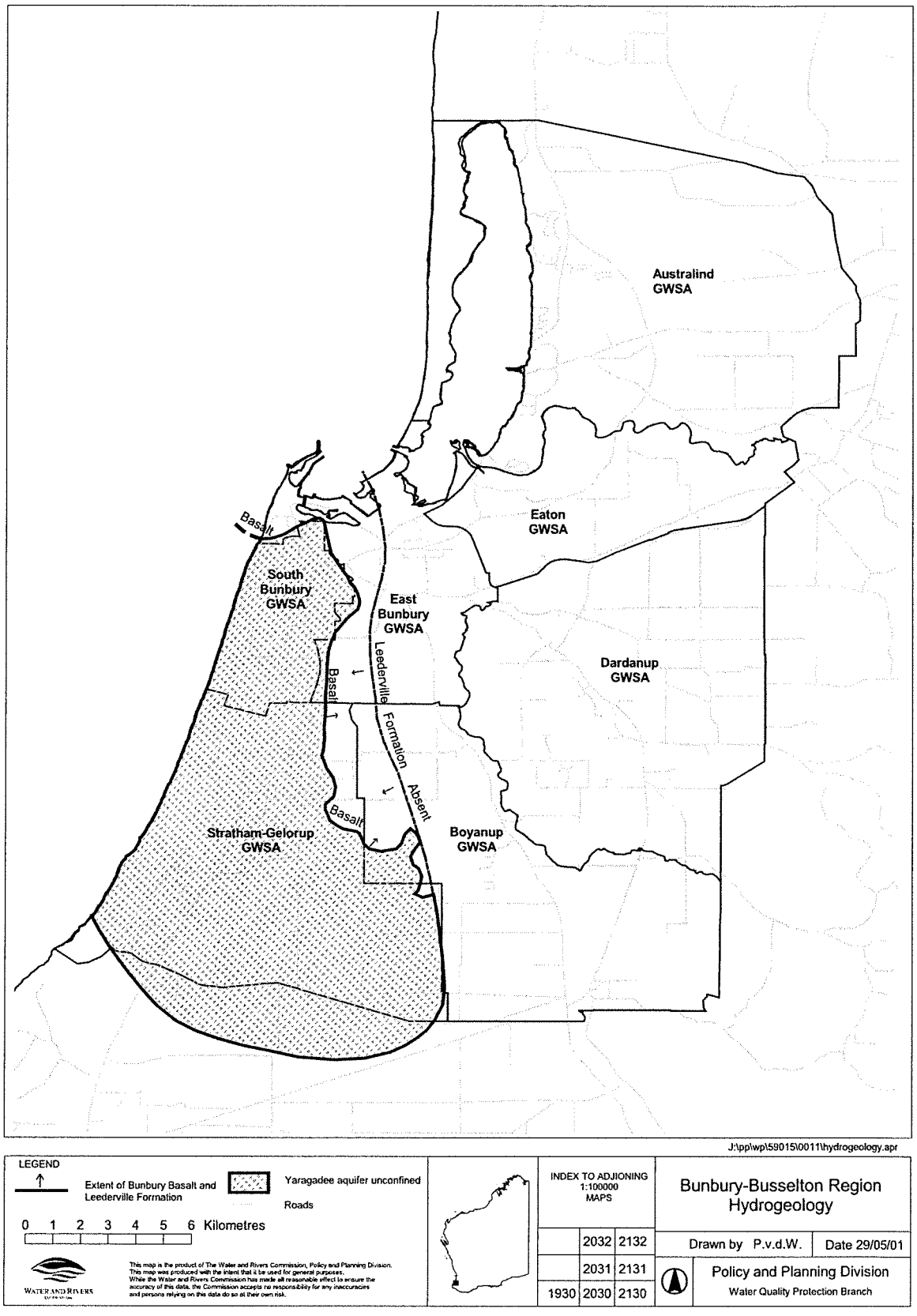

Figure 2. Bunbury Busselton region hydrogeology

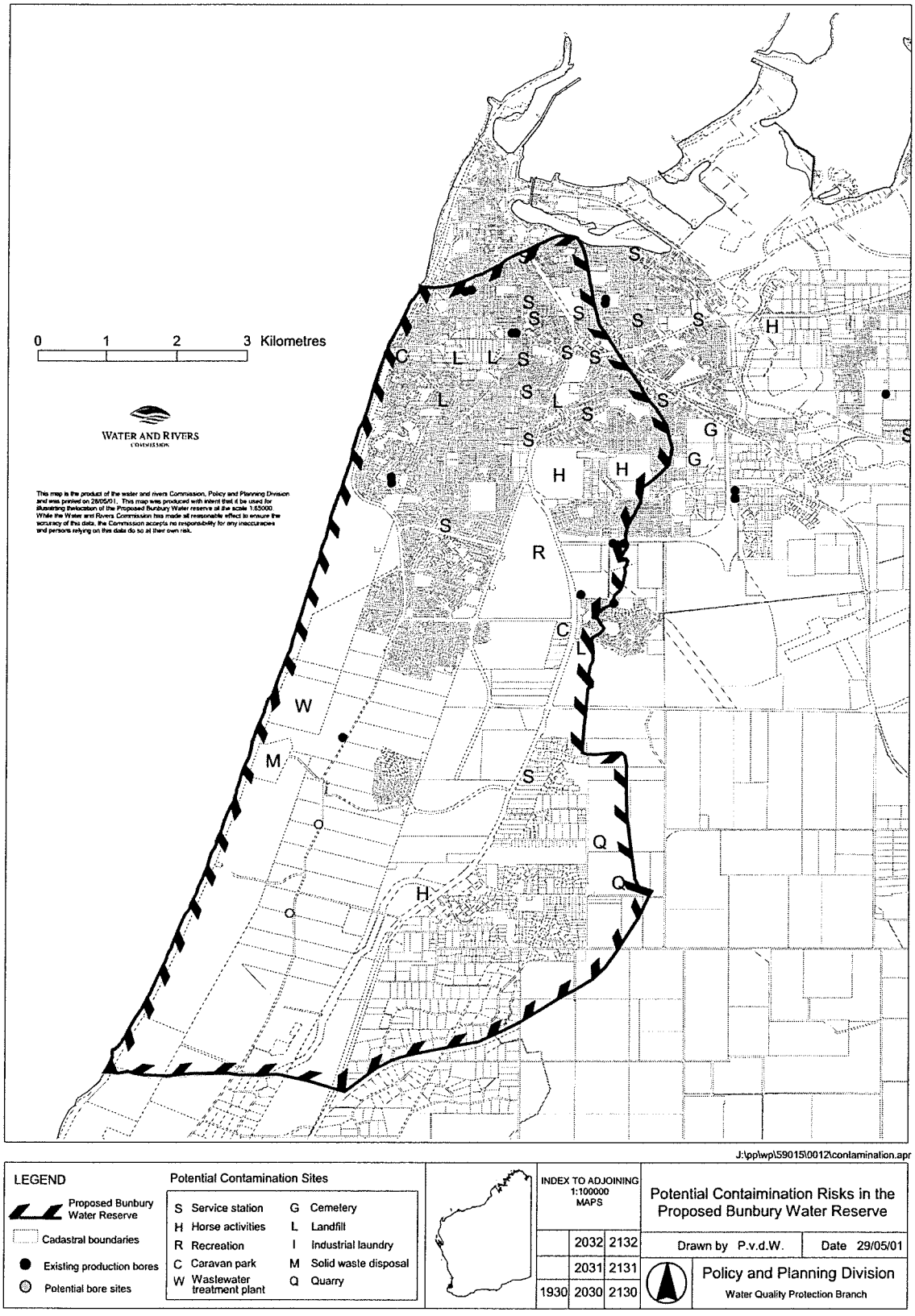

Figure 3. Potential contamination risks in the proposed Bunbury Water Reserve

6. Existing and proposed land use

The production bores in the Bunbury – Busselton area are screened in the Leederville and Yarragadee aquifers. These aquifers are generally confined, so are not vulnerable to contamination from land uses in the immediate vicinity.

The Aqwest and Water Corporation (Dalyellup) wellfields are screened in the Yarragadee aquifer south of the Bunbury city centre. The Yarragadee aquifer is hydraulically connected to the superficial aquifer in this area. Consequently, it is potentially vulnerable to contamination.

The following discussion refers to the area where the Yarragadee aquifer is unconfined.

Land use and activities include:

- reserves in local government ownership;
- urban, rural residential and commercial pursuits;
- recreation and tourism;
- extractive industries; and
- waste disposal.

6.1 Crown land

There are several local government reserves used for conservation (including wetlands), road reserves, and recreation.

6.2 Private land

Most private land is zoned urban. There are several commercial centres, including fuel stations. Bunbury will continue to expand on several fronts, including southwards through Dalyellup. Development of at least one commercial centre is planned for Dalyellup.

Rural residential is the dominant land use to the east and southeast of Dalyellup. These areas are not connected to reticulated sewerage schemes. The minimum lot size in the Gelorup area is 0.4 ha. South of Hastie Road the minimum lot size is 2 ha. Some areas in Gelorup have a high number of stables and equestrian activities.

6.3 Recreation and tourism

The Hay Park Regional Recreation Centre has 44 ha of sporting fields. The Carey Park Race Course (horse racing), and the Bunbury Trotting Club Course are located northeast side of Hay Park.

There are two caravan parks. The Punchbowl Caravan Park is located near the coast and is unsewered. Reticulated sewerage will not be provided through the infill sewerage program. The Bunbury Village Caravan Park is located on Bussell Highway, south of Bunbury. The Bunbury Village Caravan Park is sewered.

6.4 Extractive industries

Three basalt quarries are located east of Gelorup. The DEP licenses the quarries under the *Environmental Protection Act 1986*. Stormwater from the quarries drains to the coastal plain, where it can recharge the superficial aquifer.

6.5 Waste disposal

The Water Corporation operates the City of Bunbury wastewater treatment plant. The treatment plant is located immediately west of Dalyellup. After secondary treatment, wastewater is disposed of by infiltration in an interdunal depression. The Water Corporation is planning to reuse wastewater on Hay Park, and dispose of the excess water by deep ocean disposal. These changes are expected by 2003.

The Millennium Inorganic Chemical solid waste disposal site is also located west of Dalyellup, approximately 1 km south of the Bunbury wastewater treatment plant. Solid waste from Millennium Inorganic Chemical's titanium dioxide plant is disposed of in two interdunal depressions. The facility is licensed by the DEP, and may be used until 2010.

Several decommissioned landfill sites are located within the proposed Water Reserve.

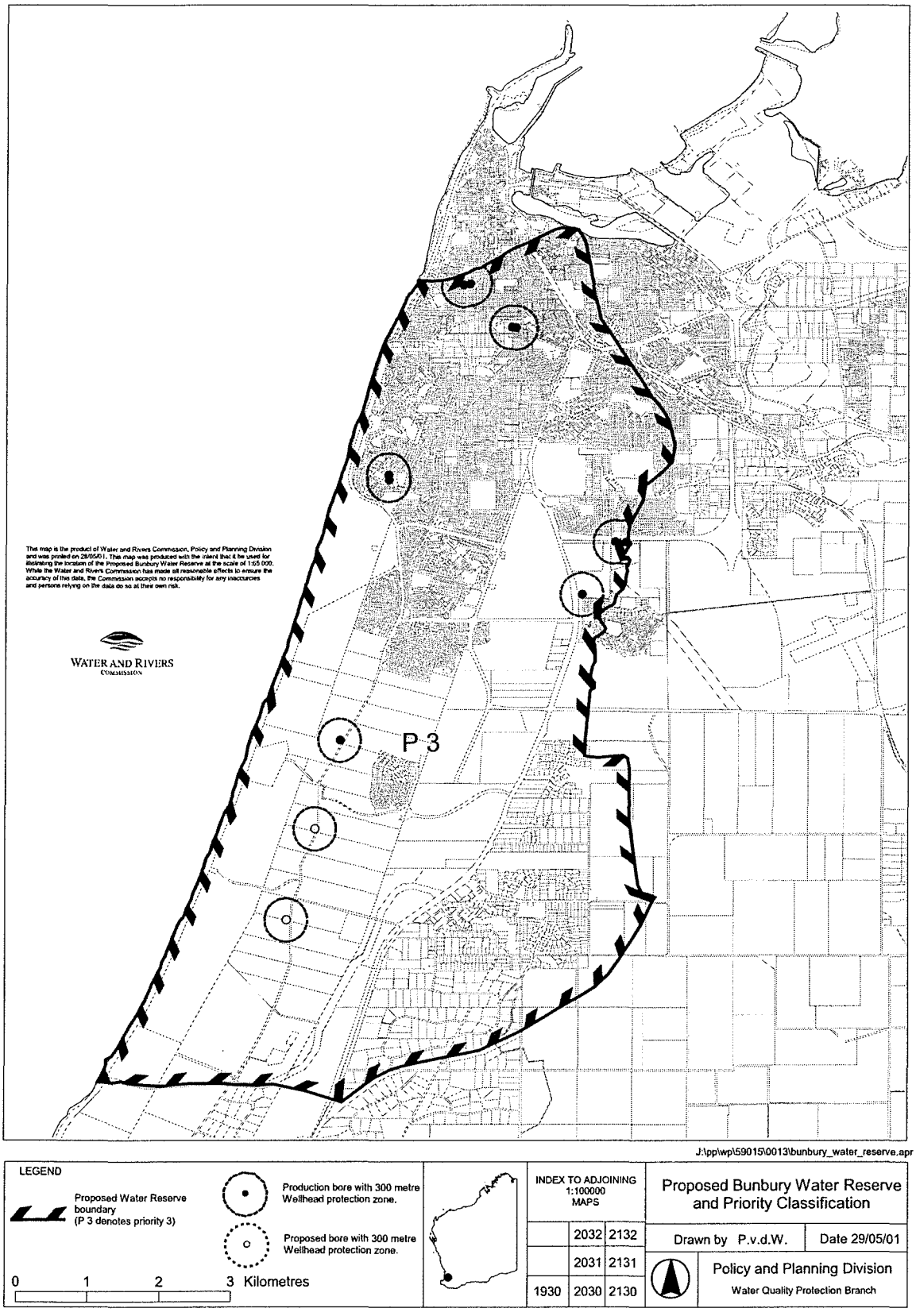

Figure 4. Proposed Bunbury Water Reserve and priority classification

7. Proposed proclaimed areas and priority classifications

It is recommended that the proposed Water Reserve be gazetted under the *Country Areas Water Supply Act, 1947.*

The proposed Bunbury Water Reserve encompasses the unconfined area of the Yarragadee aquifer and extends east to the surface drainage divide. The Water Reserve will follow the north side of the Bunbury bypass highway and Five Mile Brook south of Bunbury (refer to **Figure 4**). This will cover the local capture zones of existing and future public water supply bores where they are not confined.

Given the range of existing land uses and zoning of the land, the proposed Water Reserve should be classified for Priority 3 water source protection (refer to **Appendix 1**). This level of protection will minimise the risk of pollution through use of best management practices.

The Priority 3 classification is justified based on the following criteria:

- much of the land is identified for urban, future urban, rural residential and rural land uses under the Greater Bunbury Structure Plan;
- water supply needs co-exist with other land uses; and
- water quality may be degraded given the land use in the area.

7.1 Wellhead protection zone (WHPZ)

Wellhead protection zones should be established within the Water Reserve, consisting of a 300-metre radius around each bore, except where truncated by the boundary of the proposed Water Reserve.

Development proposals within these areas should be carefully considered to ensure management of immediate contamination risks.

8. Management of potential water quality risks

The priority classifications proposed in this plan are based on protection of the water source while recognising existing land use in the area. This plan aims to balance water quality protection and social needs and aspirations as much as possible.

8.1 Protection objectives

Contamination of groundwater has been observed worldwide. This is most critical where the groundwater is a resource which would need to be replaced, at some cost, should it become polluted.

In Western Australia, a large number cities and towns rely on groundwater sources for public drinking water supply. In some country regions, groundwater is the sole water supply source for drinking purposes. These resources may also be limited in quantity and to ensure a continued water supply, appropriate water quality protection is required to avoid the source becoming polluted.

Sources of groundwater contamination are referred to as either point sources or diffuse sources. Point sources of contamination refer to cases where contamination is localised and is centred on one or more identifiable structures (e.g. effluent discharge). Diffuse sources of contamination refer to cases where contamination originates from a widespread area and cannot be ascribed to a sole source (e.g. agricultural runoff). Both point sources and diffuse sources of contamination are of comparable significance and concern, which may detrimentally affect the chemical and microbiological quality of groundwater.

A number of chemicals, both organic and inorganic (including some pesticides), are of concern in drinking water from a health perspective because some are toxic to humans and some are suspected of causing cancer (NHMRC & ARMCANZ, 1996).

The most common and widespread health risk associated with drinking water is contamination, either directly or indirectly, by human or animal excreta, and with the microorganisms contained in faeces. Drinking water should not contain organisms capable of causing disease.

There are a number of barriers in a public water supply system that may be put in place to ensure the microbiological safety of drinking water. The primary barrier is to protect against the risk of contamination in the first instance.

The objective for Priority 3 classification is to manage the risk of pollution to the water source. This is achieved through the use of management guidelines.

8.2 Best management practices

Best management practices for land use activities are encouraged to help protect water quality.

To assist the adoption of sound environmental practice, guidelines for specific industries are being progressively developed in conjunction with other agencies (e.g. Agriculture Western Australia, Department of Environmental Protection) and the relevant peak industry body (e.g. WA Pork Producers Association). Examples include the recently released Dairy Guidelines and Draft Cattle Feedlot and Viticulture Guidelines. These guidelines incorporate a practical, commonsense approach to environmental management issues and are aimed at avoiding unreasonable burden to industry.

On freehold land, the Commission aims to inform landowners and managers about the protection of public drinking water supplies through environmental management guidelines and other informative material. The Commission recommends the use of best management practice for water quality protection through provision of management advice in the form of environmental guidelines and the Commission's Water Quality Protection Notes.

8.3 Land use planning

The establishment of appropriate protection mechanisms in statutory land use planning processes is necessary to secure the long-term protection of water sources.

The Water and Rivers Commission's *Water Quality Protection Note: Land Use Compatibility in Public Drinking Water Source Areas* outlines the compatibility of a range of land uses within PDWSAs (Appendix 1).

It is appropriate that the City of Bunbury and Shire of Capel refer developments that may impact upon water quality within the proposed Water Reserve to the Water and Rivers Commission for assessment and advice. This includes land uses considered conditional with Priority 3 protection objectives.

8.4 Emergency response

Escape of chemicals during unforeseen incidents and use of chemicals during emergency response can cause groundwater contamination. The City of Bunbury and Shire of Capel Local Emergency Management Advisory Committees, through the Bunbury Emergency Management District, should be familiar with the location and purpose of the Bunbury Water Reserve. A locality plan should be provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team. The Water and Rivers Commission should have an advisory role to any HAZMAT incident in the Bunbury Water Reserve.

Personnel who deal with WESTPLAN - HAZMAT incidents within the area should be given ready access to a locality map of the Water Reserve. These personnel should receive training to ensure an understanding of the potential impacts of spills on the groundwater resource.

8.5 Land use, potential water quality risks and recommended strategies

Table 3 details the existing land uses in the proposed Water Reserve and the potential water quality risks, and leads through a discussion to a recommended strategy for managing the risk.

The discussion and recommended strategies balance the need to protect water quality for the community in the long term, with the rights of landowners to continue to utilise land for lawful purposes.

Table 3. Land use, potential water quality risks and recommended strategies

Issue	Threats / risks	Potential Impact to Wellfield	Likelihood	Current Preventative Measures	Suggested Protection Measures
Crown Land					
Transport of fuel and chemicals along roads	Accidents with associated spillage, causing hydrocarbon and chemical contamination.	High	Moderate	• Emergency response plan for incident management associated with Westplan HAZMAT.	• Ensure awareness of need to protect water resources is part of emergency response plan. • Signage to indicate the Water Reserve boundary and emergency contact number.
Private Land (Urban, commercial, rural residential, rural)					
Urban development	The potential water quality risks associated with this activity are: • nutrient and pathogen contamination from household septic tanks; • nutrient and chemical contamination from the use of fertilisers and pesticides on gardens; and • contamination from household chemicals.	Moderate	High	• Regular monitoring of water quality from production bores. • Infill sewerage program. • Planning approval requires provision of deep sewerage.	• Educate landowners about water quality protection and best management practices.
Rural residential	The potential water quality risks associated with this activity are: • nutrient and pathogen contamination from household septic tanks; • nutrient and chemical contamination from the use of fertilisers and pesticides; and • contamination from household chemicals.	Moderate	Moderate	• Regular monitoring of water quality from production bores. • Planning and development controls.	• Educate landowners about water quality protection.

Issue	Threats / risks	Potential Impact to Wellfield	Likelihood	Current Preventative Measures	Suggested Protection Measures
Rural	The potential water quality risks associated with this activity are: • nutrient and pathogen contamination from household septic tanks; • nutrient and chemical contamination from the use of fertilisers and pesticides; and • hydrocarbon contamination from fuel storage and spills.	Low	Low	• Regular monitoring of water quality from production bores. • Existing planning and development constraints limit intensive horticulture.	• Educate landowners about water quality protection. • Encourage adoption of best management practices.
Equestrian pursuits	The potential water quality risks associated with this activity are nutrient and pathogen contamination from animal excreta.	Moderate	Moderate	• Regular monitoring of water quality from production bores.	• Encourage adoption of guidelines in the Commission's *Water Quality Protection Note: Stabling and Agistment of Horses.*
Commercial development	The potential water quality risks associated with this activity are chemical and hydrocarbon contamination from fuel / chemical storage and spills.	High	Moderate	• Regular monitoring of water quality from production bores. • Infill sewerage program. • Connection to deep sewerage is required through the planning approval process.	• Ensure appropriate siting of commercial development through the land use planning process. • Implement best management practices for new commercial developments. • Consider location of existing commercial development when establishing new production bores.

Issue	Threats / risks	Potential Impact to Wellfield	Likelihood	Current Preventative Measures	Suggested Protection Measures
Service stations	The potential water quality risks associated with this activity are hydrocarbon contamination from the storage and disposal of fuel and oil.	High	High	• Regular monitoring of water quality from production bores.	• Ensure progressive compliance with the Commission's *Water Quality Protection Note: Toxic and Hazardous Substances in Public Drinking Water Source Areas.* • New tank installations should be consistent with the Commission's *Water Quality Protection Note: Underground Chemical Storage Tank in Public Drinking Water Source Areas.* • Review wellfield monitoring programs to ensure appropriate monitoring to detect indications of contamination. • Ensure compliance with Department of Minerals and Energy's *Guidance Note S321: Removal and Disposal of Underground Petroleum Storage Tanks.* • Consider service station locations when establishing new bores.

Issue	Threats / risks	Potential Impact to Wellfield	Likelihood	Current Preventative Measures	Suggested Protection Measures
Recreation / Tourism					
Hay Park recreation area	The potential water quality risks associated with this area are nutrient and chemical contamination from the use of fertilisers and pesticides on playing fields.	Moderate	High	Unknown.	• Educate managers about fertiliser and pesticide application and water quality risks. • Encourage adoption of best management practices (*Environmental Guidelines – Establishment and Maintenance of Turf and Grassed Areas*).
Horse activities	The potential water quality risks associated with this activity are: • nutrient and pathogen contamination from septic tanks and animal excreta; and • nutrient and chemical contamination from the use of fertilisers and pesticides.	Moderate	Low	• Regular monitoring of water quality from production bores. • Excreta is collected and stored in lined excavations and sold.	• Encourage adoption of best management practices.
Caravan parks	The potential water quality risks associated with this activity are: • nutrient and pathogen contamination from septics; and • nutrient and chemical contamination from the use of fertilisers and pesticides on gardens.	Moderate	Low	• Regular monitoring of water quality from production bores. • Bunbury Village Caravan Park is connected to deep sewerage.	• Educate park owners about water quality protection.

Issue	Threats / risks	Potential Impact to Wellfield	Likelihood	Current Preventative Measures	Suggested Protection Measures
Extractive Industries					
Extractive industries (Basalt quarries and construction sand)	The potential water quality risks associated with this activity are: • hydrocarbon contamination from the storage of fuels; • nutrient and pathogen contamination from waste disposal systems; and • the loss of water through evaporation and inappropriate rehabilitation.	High	Low	• All three basalt quarries are licensed by DEP under Part V of the Environmental Protection Act. Licence conditions are adequate to protect the water resource. Conditions include containment of hydrocarbons and other chemicals. • No sand mines currently operating.	• Requirement that the Commission's *Statewide Policy No. 1: Policy and Guidelines for Construction and Silica Sand Mining in Public Drinking Water Source Areas* be adopted by new sand mining operations.
Waste Disposal					
Landfill sites (ceased operating about ten years ago)	The potential water quality risks associated with landfill sites are nutrient, pathogen, heavy metal and other chemical contamination.	Moderate	Moderate	• Regular monitoring of water quality from production bores.	• Assess the wellfield monitoring results for contaminant trends. • Review the monitoring program to ensure appropriate monitoring to detect indications of contamination. • Consider location of these sites when establishing new production bores.

Issue	Threats / risks	Potential Impact to Wellfield	Likelihood	Current Preventative Measures	Suggested Protection Measures
Wastewater treatment plant	The potential water quality risks are nutrient and pathogen contamination from disposal of wastewater.	Moderate	Low	• Licensed under Part V of the Environmental Protection Act. • Regular monitoring to detect groundwater contamination, and demonstrate no inland movement of contaminants. • By 2003, wastewater will be used to irrigate Hay Park, and the excess water will be disposed of through a deep ocean outfall.	• Maintain close liaison with DEP to ensure early notification of poor monitoring results.
Millennium Inorganic Chemical solid waste disposal area	The potential water quality risks are chemical contamination from disposed material.	Low	Low	• Licensed under Part V of the Environmental Protection Act. Licence conditions are adequate to protect drinking water. • Regular monitoring to detect groundwater contamination, and demonstrate no inland movement of contaminants. • Disposal life will not be extended beyond 2008.	• Maintain close liaison with DEP to ensure early notification of poor monitoring results.

Recommendations

1. Gazette the proposed Bunbury Water Reserve under the *Country Areas Water Supply Act 1947.*

2. Planning strategies should incorporate the management principles outlined in the Water and Rivers Commission's *Land Use Compatibility in Public Drinking Water Source Areas* (refer to **Appendix 1**) and reflect the Priority 3 classification given to the Water Reserve.

3. All development proposals in the proposed Water Reserve which are likely to impact on water quality should be referred to the Water and Rivers Commission.

4. Signs should be erected along the boundaries and within the proposed Water Reserve to define the areas and promote public awareness of the need to protect water quality.

5. Incidents covered by WESTPLAN – HAZMAT in the Bunbury Water Reserve should be addressed through the following measures:

- The Local Emergency Management Advisory Committee (through the Bunbury Emergency Management District) being familiar with the location and purpose of the Bunbury Water Reserve.
- The locality plan for the Bunbury Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team.
- The Water and Rivers Commission advising the HAZMAT Emergency Advisory Team during incidents in the Bunbury Water Reserve.
- Personnel dealing with WESTPLAN - HAZMAT incidents in the area given ready access to a locality map of the Water Reserve and training to understand the potential impacts of spills on the groundwater resource.

6. A surveillance program should be established to identify any incompatible land uses or potential contaminant threats within the proposed Water Reserve. Delegation of appropriate water source protection powers (principally surveillance and by-law enforcement) to water service providers.

7. Review the groundwater quality monitoring programs for production bores to ensure key characteristic parameters are included. Routinely review water quality analysis to detect any adverse trends or results.

8. Ensure service stations progressive compliance with the Water and Rivers Commission's *Water Quality Protection Note: Toxic and Hazardous Substances in Public Drinking Water Source Areas.*

9. Consider location of water quality risks when planning the location of new bores.

10. Encourage adoption of the Water and Rivers Commission's *Statewide Policy No. 1: Policy and Guidelines for Construction and Silica Sand Mining in Public Drinking Water Source Areas* by new sand mining operations.

11. Encourage adoption of the Water and Rivers Commission's *Water Quality Protection Note: Stabling and Agistment of Horses.*

12. Maintain close liaison with DEP to ensure early notification of poor monitoring results from licensed premises.

13. Implementation of these recommendations should be reviewed annually. A full review of this protection plan should be undertaken approximately every five years.

Implementation strategy

No.	Description	Implemented by	Timing
1.	Gazettal of Water Reserve.	Program Manager, Protection Planning (WRC)	2001-02
2.	Incorporation into land planning strategies.	Ministry for Planning, City of Bunbury, Shire of Capel	Ongoing
3.	Referral of development proposals: (i) WRC to provide the City of Bunbury, Shire of Capel, Ministry for Planning with guidelines for referral of development proposals; (ii) referral of development proposals.	(i) Program Manager, Protection Planning (WRC) (ii) City of Bunbury, Shire of Capel, Ministry for Planning, Department of Environmental Protection, Department of Minerals and Energy	(i) 2001-02 (ii) Ongoing
4.	Erection of signs: (i) development of guidelines for signage; (ii) determine number and location of signs required; (iii) erect signs.	(i) Program Manager, Protection Planning (WRC) (ii) Regional Manager, South West Region (WRC), Aqwest, Water Corporation (iii) Regional Manager, South West Region (WRC), Aqwest, Water Corporation	(i) 2001-02 (ii) On completion of signage guidelines (iii) On completion of signage guidelines

5.	Incidents covered by WESTPLAN – HAZMAT in the Bunbury Water Reserve should be addressed through the following measures:				
	(i) the Local Emergency Management Advisory Committee (through the Bunbury Emergency Management District) being familiar with the location and purpose of the Water Reserve;	(i)	Local Emergency Management Advisory Committee (through WRC South West region)	(i)	2001-02
	(ii) the locality plan for the Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team;	(ii)	WRC (South West Region)	(ii)	2001-02
	(iii) the Water and Rivers Commission advising the HAZMAT Emergency Advisory Team during incidents in the Water Reserve;	(iii)	WRC (South West Region)	(iii)	Ongoing
	(iv) personnel dealing with WESTPLAN - HAZMAT incidents in the area given ready access to a locality map of the Water Reserve and training to understand the potential impacts of spills on the groundwater resource.	(iv)	Local Emergency Management Advisory Committee	(iv)	Ongoing
6.	Surveillance program:				
	(i) develop guidelines for the surveillance of Water Reserves;	(i)	Program Manager, Protection Planning (WRC)	(i)	2001-02
	(ii) consider delegation of surveillance and by-law enforcement to water service provider/s;	(ii)	Program Manager, Protection Planning (WRC)	(ii)	2001-02
	(iii) implement the surveillance program.	(iii)	Regional Manager, South West Region (WRC)	(iii)	On completion of surveillance guidelines
7.	Water quality monitoring program:				
	(i) review the monitoring program as per the recommendations;	(i)	Aqwest, Water Corporation	(i)	Ongoing
	(ii) advise WRC of adverse trends / results.	(ii)	Aqwest, Water Corporation	(ii)	Ongoing

8.	Service stations: (i) ensure progressive compliance with the Water and Rivers Commission's *Water Quality Protection Note: Toxic and Hazardous Substances in Public Drinking Water Source Areas.*	WRC (South West Region)	Ongoing
9.	Consider location of known water quality risks when planning the location of new bores.	Aqwest, Water Corporation	Ongoing
10.	Sand mining: Encourage adoption of the Water and Rivers Commission's *Statewide Policy No. 1: Policy and Guidelines for Construction and Silica Sand Mining in Public Drinking Water Source Areas* by new sand mining operations.	WRC (South West Region), Shire of Capel	Ongoing
11.	Equestrian pursuits: Encourage adoption of the Water and Rivers Commission's *Water Quality Protection Note: Stabling and agistment of horses.*	WRC (South West Region), in consultation with the Shire of Capel	Ongoing
12.	Maintain close liaison with DEP to ensure early notification of poor monitoring results from licensed premises.	WRC (South West Region)	Ongoing
13.	Review of this plan and recommendations: (i) review implementation strategy annually; (ii) full review after 5 years.	(i) Water Quality Protection Branch (WRC) (ii) Water Quality Protection Branch (WRC)	(i) Annually (ii) 2005-06 (full review)

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Glossary

Abstraction	Pumping groundwater from an aquifer.
Allocation	The quantity of groundwater permitted to be abstracted by a well licence, usually specified in kilolitres/year (kL/a).
Alluvium (alluvial)	Detrital material which is transported by streams and rivers and deposited.
Aquifer	A geological formation or group of formations able to receive, store and transmit significant quantities of water.
Bore	A narrow, lined hole drilled to monitor or withdraw groundwater.
Capture Zone	An area contributing groundwater flow to public water supply bores.
Catchment	The area of land which intercepts rainfall and contributes the collected water to surface water (streams, rivers, wetlands) or groundwater.
Confined Aquifer	An aquifer that is confined between shale and siltstone beds and therefore contains water under pressure.
Diffuse Source Pollution	Pollution originating from a widespread area, e.g. urban stormwater runoff, agricultural runoff.
Effluent	The liquid, solid or gaseous wastes discharged by a process, treated or untreated.
Groundwater	Water which occupies the pores and crevices of rock or soil.
Hydrogeology	The study of groundwater, especially relating to the distribution of aquifers, groundwater flow and groundwater quality.
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 AHD	Australian Height Datum. Height in metres above Mean Sea Level +0.026 m at Fremantle.
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	Specific localised source of pollution, e.g. sewage or effluent discharge, industrial waste discharge.
Pollution	Water pollution occurs when waste products or other substances, e.g. 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 Water Source Area	(PWSA) As for UWPCA, but allowing the taking of groundwater for public supplies.
Recharge	Water infiltrating to replenish an aquifer.
Recharge Area	An area through which water from a groundwater catchment percolates to replenish (recharge) an aquifer. An unconfined aquifer is recharged by rainfall throughout its distribution. Confined aquifers are recharged in specific areas where water leaks from overlying aquifers, or where the aquifer rises to meet the surface.
Runoff	Water that flows over the surface from a catchment area, including streams.
Saltwater Intrusion	The inland intrusion of saltwater into a layer of fresh groundwater.
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.
Unconfined Aquifer	An aquifer containing water, the upper surface of which is lower than the top of the aquifer. The upper surface of the groundwater within the aquifer is called the watertable.
Underground Water Pollution Control Area	UWPCA) An area defined under the Metropolitan Water Supply, Sewerage and Drainage Act, in which restrictions are put on activities that 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.
Watertable	The upper saturated level of the unconfined groundwater.
Wellfield	A group of bores to monitor or withdraw groundwater.

Appendix : Land Use Compatibility in Public Drinking Water Source Areas

LAND USE COMPATIBILITY IN PUBLIC DRINKING WATER SOURCE AREAS

Purpose

To provide information on land use and activities that may impact on the quality of the State's water resources.

These notes provide a basis for developing formal guidelines in consultation with key stakeholders.

Scope

These notes apply to proposed and existing land use within Public Drinking Water Source Areas (PDWSAs).

PDWSAs include Underground Water Pollution Control Areas, Water Reserves and public water supply catchment areas declared under the *Metropolitan Water Supply, Sewerage and Drainage Act 1909*, and the *Country Areas Water Supply Act 1947*.

Preamble

The following notes reflect the Commission's current position. They are recommendations only, and may be varied at the discretion of the Commission.

Overview of Protection Framework

The Water and Rivers Commission is responsible for managing and protecting Western Australia's water resources. The Commission has policies for the protection of public drinking water source areas that include three levels of priority classification of lands within PDWSAs.

Priority 1 (P1) source protection areas are defined to ensure that there is **no degradation** of the water source. P1 areas are declared over land where the provision of the highest quality public drinking water is the prime beneficial land use. P1 areas would typically include land under Crown ownership. P1 areas are managed in accordance with the principle of **risk avoidance** and so land development is generally not permitted.

Priority 2 (P2) source protection areas are defined to ensure that there is **no increased risk of pollution** to the water source. P2 areas are declared over land where low intensity development (such as rural) already exists. Protection of public water supply sources is a high priority in these areas. P2 areas are managed in accordance with the principle of **risk minimisation** and so conditional development is allowed.

Priority 3 (P3) source protection areas are defined to **manage the risk of pollution** to the water source. P3 areas are declared over land where water supply sources need to co-exist with other land uses such as residential, commercial and light industrial developments.
Protection of P3 areas is achieved through **management guidelines** for land use activities. If the water source does become contaminated, then water may need to be treated or an alternative water source found.

In addition to priority classifications, **well-head protection zones** and **reservoir protection zones** are defined to protect the water source from contamination in the immediate vicinity of production bores and reservoirs. Well-head protection zones are usually circular, with a radius of 500 metres in P1 areas and 300 metres in P2 and P3 areas. Reservoir protection zones usually consist of a 2 kilometre buffer area around the top water level of a reservoir and include the reservoir itself. These zones do not extend outside water reserves. Special conditions apply within these zones.

Tables showing Land Use Compatibility with the Commission's PDWSA protection strategy

These tables should be used as a guideline only. More detailed information on the Commission's requirements in the form of activity guidelines or notes is available for some land uses. These can be found on the 'Protecting Water' web page on the Commission's Internet site (www.wrc.wa.gov.au). Alternatively information relating to land use and development within PDWSAs including those not listed in the tables, can be obtained from the Commission's Water Quality Protection Branch.

The Commission recognises that many activities were established before the introduction of these tables. The Commission will negotiate with the operators of such activities to develop appropriate management practices to minimise the impact on water resources.

These tables do not replace the need for assessment by the Commission. Please consult the Commission for advice on any land use proposals in Public Drinking Water Source Areas that may impact on water resources.

Definitions used in the following tables

Compatible	The land use is compatible with the management objectives of the priority classification.
Incompatible	The land use is incompatible with the management objectives of the priority classification.
Conditional	The land use can be compatible with the management objectives of the priority classification, with appropriate site management practices. All conditional developments / activities should be referred to the Commission for assessment on a case specific basis.
Extensive	Where limited additional inputs are required to support the desired land use. eg supplementary animal feed only during seasonal dry periods.
Intensive	Where regular additional inputs are required to support the desired land use. eg irrigation, fertilisers and non forage animal feed dominates.

More information

We welcome your comment on these notes. They will be updated from time to time as comments are received or activity standards change. The Commission is progressively developing Water Quality Protection Notes and Guidelines covering land uses described in the attached tables. Advice on available guidance documents may be obtained by contacting the Commission.

If you wish to comment on the notes or require more information, please contact the Commission's Water Quality Protection Branch at the Hyatt Centre in East Perth.
Phone: (08) 9278 0300 (business hours) or Fax:(08) 9278 0585.
E-mail: use the {feedback} section at our Internet address (http://www.wrc.wa.gov.au) citing the topic and version.

Tables showing Land use compatibility with PDWSA protection objectives

AGRICULTURE - ANIMALS

Land use	Priority 1	Priority 2	Priority 3
Animal saleyards and stockyards[14]	Incompatible	Incompatible[7]	Conditional[7]
Apiaries on Crown land	Conditional	Conditional	Conditional
Aquaculture eg. crustaceans, fish, algae farms	Incompatible	Conditional	Conditional
Dairy sheds	Incompatible	Incompatible[11,15]	Conditional[15]
Feedlots	Incompatible	Incompatible	Conditional
Livestock grazing - pastoral leases	Conditional	Compatible	Compatible
Livestock grazing - broad acre (extensive)	Incompatible	Conditional[11]	Compatible
Livestock grazing (intensive)	Incompatible	Incompatible	Conditional[11]
Piggeries	Incompatible	Incompatible	Incompatible
Poultry farming (housed)	Incompatible	Conditional	Conditional
Stables	Incompatible	Conditional	Compatible

AGRICULTURE - PLANTS

Land use	Priority 1	Priority 2	Priority 3
Broad acre cropping i.e. non-irrigated	Incompatible	Conditional[1]	Compatible
Floriculture (extensive)	Incompatible	Conditional	Compatible
Floriculture (intensive)	Incompatible	Incompatible	Conditional
Horticulture- hydroponics	Incompatible	Conditional	Conditional
Horticulture - market gardens	Incompatible	Incompatible	Conditional
Orchards	Incompatible	Conditional	Compatible
Nurseries (potted plants)	Incompatible	Conditional	Compatible
Silviculture (tree farming)	Conditional	Conditional	Compatible
Turf farms	Incompatible	Incompatible	Conditional
Viticulture (wine & table grapes)	Incompatible	Conditional	Compatible

DEVELOPMENT - COMMERCIAL

Land use	Priority 1	Priority 2	Priority 3
Aircraft servicing	Incompatible	Incompatible	Conditional[6]
Airports or landing grounds	Incompatible	Incompatible	Conditional[6]
Amusement centres	Incompatible	Incompatible	Compatible[6]
Automotive businesses	Incompatible	Incompatible	Conditional[6]
Boat servicing	Incompatible	Incompatible	Conditional[6]
Catteries	Incompatible	Compatible	Compatible
Caravan and trailer hire	Incompatible	Incompatible	Conditional[6]
Consulting rooms	Incompatible	Incompatible[7]	Compatible[6]
Concrete batching and cement products	Incompatible	Incompatible	Conditional
Cottage Industries	Conditional	Conditional	Compatible
Dog kennels	Incompatible	Conditional	Conditional
Drive in / take-away food shops	Incompatible	Incompatible	Compatible[6]
Drive -in theatres	Incompatible	Incompatible	Compatible[6]
Dry cleaning premises	Incompatible	Incompatible	Conditional[6]
Farm supply centres	Incompatible	Incompatible[7]	Conditional
Fuel depots	Incompatible	Incompatible	Conditional
Garden centres	Incompatible	Incompatible	Compatible
Laboratories (analytical , photographic)	Incompatible	Incompatible	Conditional[6]
Markets	Incompatible	Incompatible	Compatible[6]
Mechanical servicing	Incompatible	Incompatible	Conditional[6]
Metal production / finishing	Incompatible	Incompatible	Incompatible
Milk transfer depots	Incompatible	Incompatible	Conditional
Pesticide operator depots	Incompatible	Incompatible	Incompatible
Restaurants and taverns	Incompatible	Incompatible	Compatible[6]
Service stations	Incompatible	Incompatible	Conditional[6]
Shops and shopping centres	Incompatible	Incompatible[7]	Compatible[6]
Transport depots	Incompatible	Incompatible	Conditional
Vehicle parking (commercial)	Incompatible	Incompatible	Compatible
Vehicle wrecking and machinery	Incompatible	Incompatible	Conditional
Veterinary clinics / hospitals	Incompatible	Incompatible[7]	Conditional[6]

DEVELOPMENT - INDUSTRIAL

Land use	Priority 1	Priority 2	Priority 3
Heavy Industry	Incompatible	Incompatible	Incompatible
Light or general Industry	Incompatible	Incompatible	Conditional[6]
Power Stations	Incompatible	Incompatible	Incompatible

DEVELOPMENT - URBAN

Land use	Priority 1	Priority 2	Priority 3
Aged and dependent persons group dwellings	Incompatible	Incompatible	Compatible[6]
Cemeteries	Incompatible	Incompatible	Conditional
Civic buildings	Incompatible	Conditional[7]	Compatible[6]
Clubs -sporting or recreation	Incompatible	Conditional	Compatible[6]
Community halls	Incompatible	Conditional[7]	Compatible
Family day care centres	Incompatible	Incompatible[7]	Compatible[6]
Funeral parlours	Incompatible	Incompatible	Compatible[6]
Health centres	Incompatible	Incompatible	Compatible[6]
Hospitals	Incompatible	Incompatible	Conditional[6]
Medical centres	Incompatible	Incompatible	Compatible[6]
Toilet blocks and change rooms	Incompatible[7]	Conditional	Compatible

EDUCATION / RESEARCH

Land use	Priority 1	Priority 2	Priority 3
Community education centres	Conditional[7]	Conditional[7]	Compatible[6]
Primary / Secondary Schools	Incompatible	Incompatible	Compatible[6]
Scientific Research	Conditional	Conditional	Compatible
Tertiary Education Facilities	Incompatible	Incompatible	Conditional[6]

MINING AND MINERAL PROCESSING

Land use	Priority 1	Priority 2	Priority 3
Extractive industries (sand mining, quarries)	Conditional[2]	Conditional[2]	Conditional[2]
Mineral exploration	Conditional[4]	Conditional[4]	Conditional[4]
Mining	Conditional[4]	Conditional[4]	Conditional[4]
Mineral processing	Incompatible	Incompatible	Conditional[4]
Tailings dams	Incompatible	Incompatible	Conditional[4]

PROCESSING OF ANIMALS / ANIMAL PRODUCTS

Land use	Priority 1	Priority 2	Priority 3
Animal product rendering works	Incompatible	Incompatible	Incompatible
Abattoirs	Incompatible	Incompatible	Incompatible
Dairy product factories	Incompatible	Incompatible	Conditional[6]
Food Processing	Incompatible	Incompatible	Conditional[6]
Tanneries	Incompatible	Incompatible	Incompatible
Wool-scourers	Incompatible	Incompatible	Incompatible

PROCESSING OF PLANTS / PLANT PRODUCTS

Land use	Priority 1	Priority 2	Priority 3
Breweries	Incompatible	Incompatible	Conditional[6]
Composting / soil blending (commercial)	Incompatible	Incompatible	Conditional
Vegetable / food processing	Incompatible	Incompatible	Conditional[6]
Wineries	Incompatible	Incompatible	Conditional

SUBDIVISION

Land use	Priority 1	Priority 2	Priority 3
Rural subdivision to a minimum lot size of 4 ha	Incompatible	Compatible	Compatible
Rural subdivision to a lot size less than 4 ha	Incompatible	Incompatible	Incompatible
Special rural subdivision to a minimum lot size of 2 ha	Incompatible	Conditional[8,9]	Conditional[8]
Special rural subdivision to a lot size between 1 and 2 ha	Incompatible	Incompatible	Conditional[8,9]
Special rural subdivision to a lot size less than 1 ha	Incompatible	Incompatible	Incompatible
Urban subdivision	Incompatible	Incompatible	Compatible[6]
Industrial subdivision	Incompatible	Incompatible	Conditional[6]

Note: Subdivision of lots to any size within Priority 1 areas is incompatible

SPORT AND RECREATION

Land use	Priority 1	Priority 2	Priority 3
Equestrian centres	Incompatible	Incompatible	Compatible
Golf courses	Incompatible	Incompatible	Conditional[1]
Motor sports ie permanent racing facilities	Incompatible	Incompatible	Conditional
Public swimming pools	Incompatible	Incompatible	Conditional
Recreational parks -irrigated	Incompatible	Incompatible	Conditional[1]
Rifle ranges	Incompatible	Conditional	Compatible

STORAGE/ PROCESSING OF TOXIC AND HAZARDOUS SUBSTANCES (THS)

Land use	Priority 1	Priority 2	Priority 3
Above ground storage of THS	Conditional	Conditional	Conditional
Underground storage tanks for THS	Incompatible	Incompatible	Conditional

TOURISM ACCOMMODATION.

Land use	Priority 1	Priority 2	Priority 3
Bed and breakfast accommodation	Incompatible	Conditional[16]	Compatible
Caravan parks	Incompatible	Incompatible	Conditional[6]
Farm stay accommodation	Incompatible	Conditional[16]	Compatible
Motels, hotels, lodging houses, hostels	Incompatible	Incompatible	Compatible[6]

WASTE TREATMENT AND MANAGEMENT

Land use	Priority 1	Priority 2	Priority 3
Injection of liquid wastes into ground water	Incompatible	Incompatible	Incompatible
Landfills -Class I, II or III	Incompatible	Incompatible	Conditional
Landfills -Class IV and V	Incompatible	Incompatible	Incompatible
Recycling depots	Incompatible	Incompatible	Conditional
Refuse transfer stations	Incompatible	Incompatible	Conditional
Sewers (gravity)	Incompatible	Incompatible	Compatible
Sewers (pressure mains)	Incompatible	Conditional	Compatible
Sewage pump stations	Incompatible	Conditional	Conditional
Used tyre storage / disposal facilities	Incompatible	Incompatible	Incompatible
Wastewater treatment plants	Incompatible	Incompatible	Conditional
Wastewater application to land	Incompatible	Incompatible[17]	Conditional

OTHER DEVELOPMENTS

Land use	Priority 1	Priority 2	Priority 3
Caretaker's housing	Incompatible[7]	Conditional	Compatible
Drinking water treatment plants	Conditional	Conditional	Conditional
Communications receivers / transmitters	Conditional	Conditional	Conditional
Construction projects (not shown elsewhere)	Conditional	Conditional	Conditional
Forestry	Conditional[1]	Compatible	Compatible
Major transport routes	Incompatible	Conditional[10]	Compatible
National and Regional Parks[13]	Compatible	Compatible	Compatible
Nature reserves	Compatible	Compatible	Compatible

Table reference notes:

1. Conditions may limit fertiliser and pesticide application.

2. Conditions cover the storage of fuels and chemicals, the depth of mining in relation to the water table with strict guidelines for rehabilitation.

3. Conditions cover the storage and use of fuel and other chemicals.

4. Conditions placed via the mining lease and / or environmental approval.

5. Special rural development must have appropriate provisions under the Town Planning Scheme, to prevent introduction of land uses and practices that pose an unacceptable risk to water resources.

6. Must be connected to deep sewerage, except where exemptions apply under the current Government Sewerage Policy.

7. Only permitted if this use is incidental to the overall land use in the area and consistent with planning strategies.

8. Lots should only be created where land capability allows effective on-site soakage disposal of treated wastewater. Conditions apply to siting of wastewater disposal systems in areas with poor land capability and / or a shallow depth to groundwater, animals are held or fertiliser is applied. Alternative wastewater treatment systems, where approved by the Health Department, may be accepted with maintenance requirements.

9. An average rather than minimum lot size may be acceptable if the proponent can demonstrate that the water quality objectives of the source protection area are met, and caveats are placed on titles of larger blocks stating that further subdivision cannot occur.

10. Conditions cover road design, construction and the types of goods that may be carried.

11. May be permitted if animal stocking levels (number of animals per hectare) are consistent with source protection objectives.

12. May be permitted if the type, volume and storage mechanisms for chemicals are compatible with water quality protection objectives.

13. Visitor and management infrastructure and facilities must be appropriately sited and maintained.

14. This does not include on-farm / pastoral lease stock-yards used for animal husbandry

15. Waste management practices must be compatible with source protection objectives.

16. Conditions apply on density of accommodation in Priority 2 areas

17. May be permitted if the quantity and quality are compatible with water quality protection objectives.

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