Government of **Western Australia**
Department of **Water**

Important information

The *Walpole Weir and Butler's Creek Dam catchment areas drinking water source protection plan* (2007, WRP no. 58) was reviewed in 2016.

Please ensure you also read the *Walpole Weir Catchment Area drinking water source protection review* (2016, WRP no.153) alongside the 2007 plan to obtain all of the information about this drinking water source.

The 2016 review considers changes that have occurred in and around the Walpole Weir Catchment Area since the completion of the 2007 plan. Additional recommendations have been prepared to ensure the ongoing protection of this public drinking water source area:

- including the Swann Road bores and protecting them with wellhead protection zones
- reflecting new land ownership by Department of Water and Water Corporation, and new priority 1 (P1) areas
- flagging the need for the Water Corporation to investigate alternative water sources.

You can find the 2016 *Walpole Weir Catchment Area drinking water source protection review* at www.water.wa.gov.au > publications or by contacting the Department of Water on +61 8 6364 7600 or drinkingwater@water.wa.gov.au.

Department of Water
Government of Western Australia

Walpole Weir and Butler's Creek Dam Catchment Areas Drinking Water Source Protection Plan

Walpole Town Water Supply

REPORT NO.58
JUNE 2007

Water Resource Protection Series

Department of Water
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Report No. 58

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Department of Water
Level 4, 168 St Georges Terrace
Perth Western Australia 6000

<www.water.wa.gov.au>

Telephone +61-8-6364 7600
Facsimile +61-8-6364 7601

For more information about this report, contact
Program Manager Protection Planning, Water Source Protection Branch
or email drinkingwater@water.wa.gov.au.

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Subject of cover photograph
Walpole Weir, taken by Kathryn Buehrig

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Preface

The Department of Water has prepared this Drinking Water Source Protection Plan to report on the activities and risks to water quality within the Walpole Weir and Butler's Creek Dam Catchments and to recommend management strategies to minimise the identified risks.

A safe drinking water supply is critical to the well-being of the community and catchment protection is necessary to help avoid, minimise or manage risks to water quality. The Department is committed to protecting drinking water sources to ensure the continued supply of 'safe, good quality drinking water' to consumers.

The Australian Drinking Water Guidelines recommend a risk based multiple barrier 'catchment to consumer' approach to protect public drinking water. The protection and management of drinking water catchments 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 preventative strategies and operational controls to ensure the safest possible raw water supply.

This plan details the location and boundary of the drinking water catchment, which provides potable water to the Walpole Town Water Supply. 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.

This plan should be used to guide State and local government land use planning decisions. It should be recognised in the Shire of Manjimup's Town Planning Scheme, consistent with 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 Public Drinking Water Source Area.

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

	Stages in development of a Plan	Comment
1	Prepare Drinking Water Source Protection Assessment	Assessment document prepared following catchment survey and preliminary information gathering from government agency stakeholders.
2	Conduct stakeholder consultation	Advice sought from key stakeholders using the assessment as a tool for discussion.
3	Prepare Draft Drinking Water Source Protection Plan	Draft Plan developed taking into account input from stakeholders and any additional advice received.
4	Release Draft Drinking Water Source Protection Plan for public comment	Draft Plan released for a six week public consultation period.
5	**Publish Drinking Water Source Protection Plan**	**Final Plan published after considering advice received in submissions. Includes recommendations on how to protect the catchment.**

Summary

Walpole is located 423 km south of Perth and 120 km west of Albany. Walpole acts as a service centre for the nearby industries of beef and sheep farming, dairying, fishing and forestry. Viticulture is becoming increasingly popular in the area and the town also supports a thriving tourist industry.

The Walpole Town Water Supply is sourced from a weir on the Walpole River to the north west of the town, and in summer months also from Butler's Creek Dam to the north east of the town. Water from these sources supplies the Walpole town site, the nearby Boronia Ridge development, the Coalmine Beach Caravan Park and some surrounding farms. Both catchments are within the Shire of Manjimup. The catchments for these sources have not been gazetted as Catchment Areas under the *Country Areas Water Supply (CAWS) Act, 1947*. This plan recommends that both catchment areas be gazetted to ensure appropriate protection of the water supply sources.

Potential risks posed to the water quality of this source have been carefully assessed in this plan.

The objective of water source protection in both these catchments is to preserve water quality at its current level, and where practical achieve an improvement. It is recommended that Crown land and an area of private land adjacent to the weir and dam be managed for Priority 1 source protection and all remaining privately owned land in both catchments be managed for Priority 2 source protection. The existing land uses of farming and other agricultural activities are generally considered 'compatible with conditions' under a Priority 2 classification, if management controls are implemented to ensure water quality is protected.

The northern and central sections of the Walpole Weir catchment are under Crown ownership, and managed by the Department of Environment and Conservation (DEC) as National Park and State Forest as part of the Walpole Wilderness Area (WWA). The central section of the catchment is currently vested in the Water and Rivers Commission (now Department of Water) and managed for public drinking water source protection.

The only recreational site within the catchments is the Swarbrick Discovery Centre for the WWA.

Land management and farming activities in the Walpole Weir catchment include forest management and animal grazing. Land use in the Butler's Creek Dam catchment is predominantly animal grazing.

These activities have the potential to pose a risk to the water quality of this source and this plan outlines strategies to manage those risks.

The Walpole catchment is part of the larger Walpole-Nornalup Inlet System. The Walpole and Nornalup Inlet System Advisory Committee (WANISAC – now disbanded) was a community group with a number of representatives who advised on environmental issues for the system, and they were consulted in the development of this Plan. This Plan is consistent with the principles of protection for the inlet system, as detailed in the Shire of Manjimup's Local Planning Strategy 2003-2013.

This Plan has been developed in consultation with relevant stakeholders, including DEC, Water Corporation, Shire of Manjimup, special interest groups and landowners within the catchments.

1 Introduction

1.1 The stakeholders

An earlier draft version of this plan was released in 2000 to stakeholders including (but not limited to) Department for Planning and Infrastructure, Water Corporation, the Departments of Environmental Protection and Conservation and Land Management (now the Department of Environment and Conservation (DEC)), Shire of Manjimup, WANISAC and landowners. An updated draft plan was released in 2006. Submissions for both draft plans are summarised in Appendix C. Comments received have been considered in the update and preparation of this plan.

1.2 Existing water supply system

Walpole is located approximately 423 km south of Perth on the South Coast Highway. Public water supply to the town is from a weir on the Walpole River. During summer months, when river supply is limited, Butler's Creek Dam is used to supplement the source. Figure 1 shows the locality of Walpole. Figure 2 shows the catchments of the Walpole Weir and Butler's Creek Dam. The catchments have not yet been proclaimed under the *Country Areas Water Supply (CAWS) Act 1947*.

Walpole Weir is located about two kilometres west north west of the town of Walpole (see Figure 2 and Appendix B, Photo 1). It is a concrete v-notch weir approximately two metres high, constructed in 1985. The storage is negligible. The river drains a catchment area of approximately 50.5 km^2. Of this, about 10 km^2 has been added since the last release of this Plan in 2000. This is due to the discovery of an historical alteration of the natural drainage system via a culvert under North Walpole Road, which takes in an additional portion of land east of the road. Approximately 62 megalitres (ML) per year is drawn from the weir for public supply.

Butler's Creek Dam is located about three kilometres to the north east of the Walpole Weir and was constructed in 1950 as the original town water supply source (see Figure 2). The dam is an earth wall with a storage of 3 285 kilolitres (kL) and has a small catchment area of 0.41 km^2. The source has a yield of 27 ML per year and is used as a supplementary source.

All water is treated at the Walpole Water Treatment Plant, before being pumped to the summit tank within the plant. From the summit tank it gravitates to the town pipe network.

1.3 Allocation

Surface water resource utilisation and conservation in Western Australia is administered by the Department of Water in accordance with the *Rights in Water and Irrigation Act (RIWI) 1914*. Under the Act, the right to use and control surface water is

vested with the Crown. This Act requires licensing of surface water abstraction within proclaimed surface water areas.

Walpole Weir and Butler's Creek Dam are not located within a proclaimed surface water area under the *RIWI Act 1914* and therefore a licence is not required for abstraction.

2 Future planning

2.1 Future water supply requirements

In 2006 the Water Corporation commenced a review of the water supply scheme for Walpole. The drivers for the review were a revised growth projection, source protection issues and the possible impact of climate change. A number of options for future long term water source planning are still under consideration.

The Water Corporation anticipates that the planning and approvals process for a new source will take at least five years to complete, with a further two to three years for detailed design, construction and commissioning. Consultation of the community and other key stakeholders is a key element of this process. It is therefore likely that a new water source or long term augmentation of the existing sources will not be in place for at least another seven or eight years (minimum). In the meantime, the current public drinking water supply sources need to be protected through implementation of this Drinking Water Source Protection Plan.

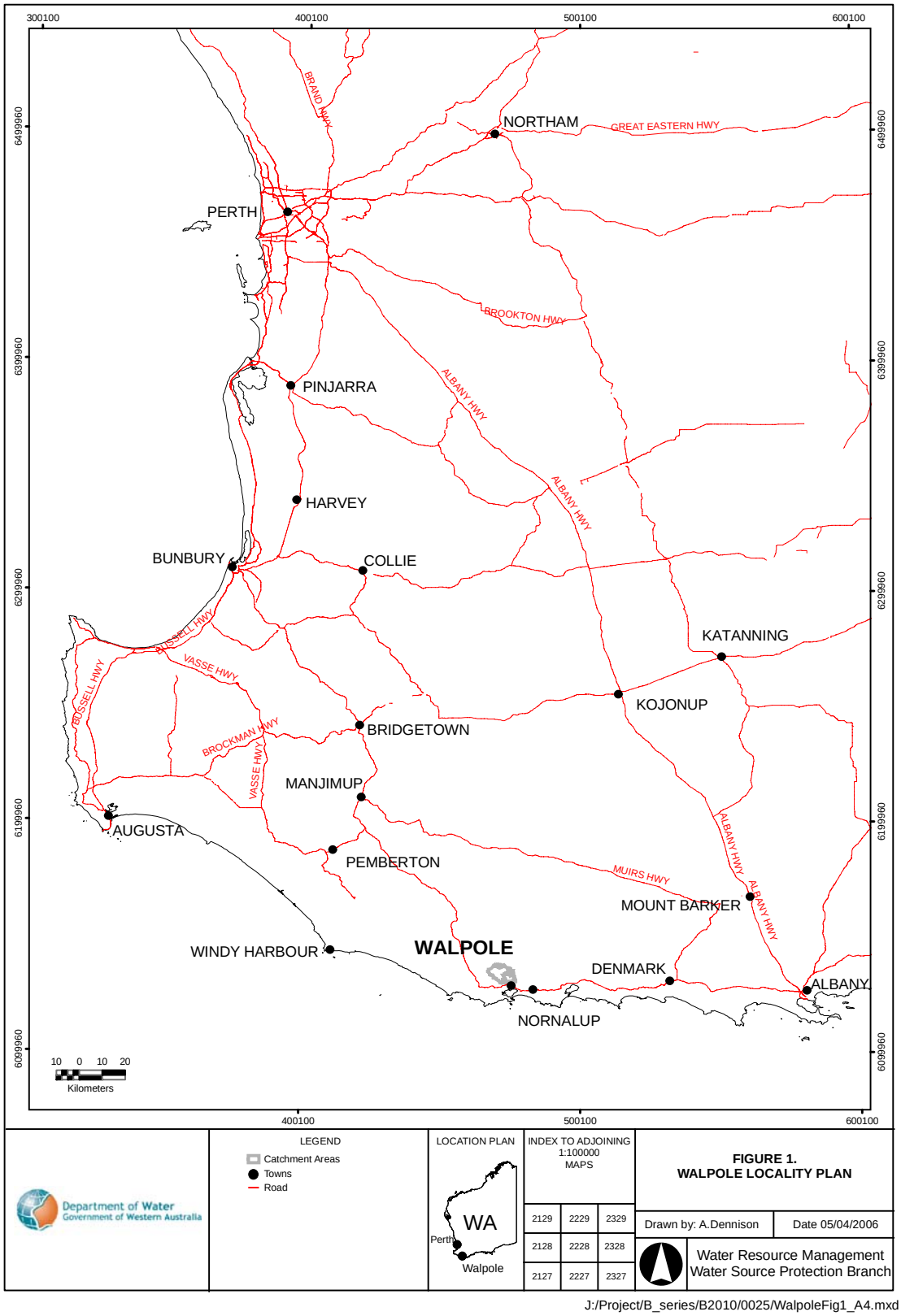

Figure 1 Walpole locality map

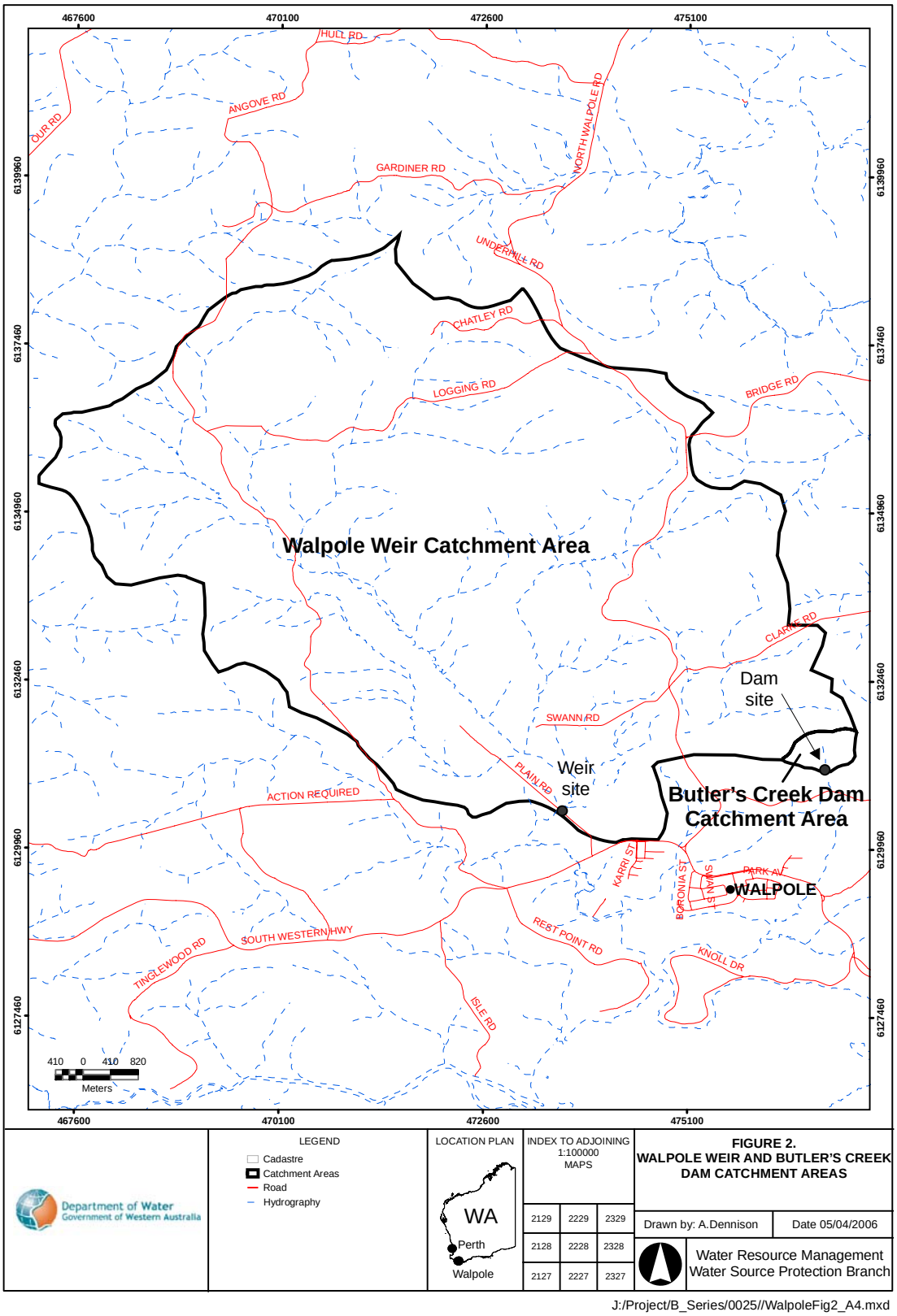

Figure 2 Walpole Weir and Butler's Creek Dam Catchment Areas

3 The catchment

3.1 Climate

Walpole has a temperate climate, characterised by warm, dry summers and cool, wet winters. The long term average rainfall for Walpole is 1321 mm which is associated with passing cold fronts. The average annual rainfall since 1974 to present is 1251 mm. This drop in rainfall has seen a statistically significant reduction in stream flow since 1975 (WRC, 1998).

3.2 Physiography

The Walpole River basin consists of flat and swampy terrain on sedimentary rock with broad drainage floors in lower reaches of streams. The associated sands have a high tendency to leach phosphorous but are at low risk of eroding.

Surrounding the basin, the remainder of the catchment consists of hills rising above the general basin level, mainly mantled by laterite outcrop with some igneous rock outcrop. The soils are sandy or gravely duplex soils that have a higher phosphorous holding capacity than the basin soils, however they can be more susceptible to erosion.

3.3 Hydrology

The Walpole Weir catchment is approximately 50.5 km^2, and is located in the Shannon River Basin. The average annual stream flow of the Walpole River at the Weir is estimated to be 19 100 ML. There is negligible storage at the weir site. Supply to the weir is generated mostly from surface run-off, however groundwater seepage provides a significant amount of flow during summer months. There is perennial flow in the Walpole River, although the average monthly flow in the winter months is significantly greater than in the summer months, hence the need to supplement the supply in summer.

Butler's Creek Dam has a small surface catchment of approximately 0.41 km^2. Summer inflow is generated largely from local groundwater seepage.

4 Water quality and treatment

4.1 Water quality

The Water Corporation regularly monitors the Walpole Weir and Butler's Creek Dam water sources for a range of parameters in accordance with the Australian Drinking Water Guidelines (ADWG). A summary of the raw water quality data for Walpole Weir and Butler's Creek Dam is shown in Appendix A.

It should be noted that the raw water from these sources is treated and chlorinated prior to supply to Walpole as drinking water. The treated drinking water supply complies with ADWG health, microbiological and aesthetic requirements. The combination of catchment protection and treatment is undertaken to ensure the availability of safe, good quality drinking water.

Microbiological contaminants

Pathogens are types of micro-organisms that are capable of causing diseases. These include bacteria (such as *Escherichia coli*), protozoa (such as *Cryptosporidium* and *Giardia*) and viruses. In water supplies the pathogens of concern that can cause illness, such as stomach upset, diarrhoea and even death, are mostly found in the faeces of humans and domestic animals. *Escherichia coli* counts are a way of measuring these pathogens and are an indicator of faecal contamination.

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

Pathogens may enter a water source through activities involving direct contact of people and domestic animals with the main water body or its tributaries (such as fishing, marroning and swimming), primarily through the transfer of faecal material, or indirectly through their presence (eg runoff moving faecal material into the water).

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

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

The effects of pathogen contamination in drinking water varies significantly, ranging from illness to death, as was the case in Walkerton, Canada in 2000 where seven people died due to contamination by *Escherichia coli* and *Campylobacter* in the town water source and supply. Preventing the introduction of pathogens into the water source is the most effective barrier in avoiding this public health risk.

The raw water microbiological quality data for Walpole Weir and Butler's Creek Dam shows both sources are significantly contaminated with faecal matter from the catchments. Agricultural land use in the catchments is a primary source of microbiological contamination and catchment management is required to reduce the impact of these activities.

Health related characteristics

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

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

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

Nutrients (such as nitrogen) can enter drinking water supplies from leaching of fertiliser, septic tanks, and from faeces of domestic animals (such as cattle grazing on the land). Nitrate and nitrite (ions of Nitrogen) can be toxic to humans at high levels, with infants less than 3 months old being most susceptible.

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

Aesthetic characteristics

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

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

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

The raw water from Walpole Weir has high colour and turbidity, and variable pH. The high colour (see Appendix B Photo 2) is due to staining from vegetation in the forested area upstream, and high turbidity from erosion. Iron concentrations in the Walpole Weir are consistently above the Australian Drinking Water Guidelines (ADWG) aesthetic guideline value, while manganese concentrations occasionally exceed the aesthetic guidelines.

The Butler's Creek Dam catchment drains a farmed area. Raw water from the dam has high colour and turbidity, variable pH and iron concentrations that are occasionally above the ADWG aesthetic guideline value.

4.2 Water treatment

The water abstracted from Walpole Weir and the Butler's Creek Dam is treated at the same site. Initially the water is treated with caustic soda, alum and polyelectrolyte in order to balance pH and to enhance flocculation and precipitation of impurities. The water then passes through a clarifying unit that removes turbidity and colour. The clarified water is stored in a 225 kL holding tank. The water is then chlorinated and transferred to the summit tank for distribution to the pipe network.

It should be recognised that although treatment and disinfection by chlorination are essential barriers used to ensure good quality drinking water, catchment management and water source protection are fundamental 'first barriers' for the protection of water quality. This approach is endorsed by the ADWG and reflects a 'catchment to consumer' risk based, multiple barrier approach for the provision of safe drinking water to consumers.

5 Land use and contamination risk

Current land uses in the Walpole Weir and Butler's Creek Dam catchments include general farming activities, National Park, State Forest management and Public Drinking Water Supply.

Land uses are illustrated in Figure 3 and Figure 4, and images are depicted in Appendix C Photo 3 and Photo 4.

5.1 Private land

Approximately one third of the land in the Walpole Weir catchment is privately owned. This land is predominantly used for animal grazing which poses a high risk of contamination. There is one dairy on North Walpole road which has recently closed. A horse trail riding property is located within the catchment on Quinn Road. All the private land is zoned 'rural' under the Shire of Manjimup's Town Planning Scheme, with one lot on the north-eastern border of the Walpole catchment with zoning of "Additional Use", which allows for holiday accommodation.

All of the land in the Butler's Creek Dam catchment is privately owned, except for the dam itself and a surrounding vegetation buffer which are owned by the Water Corporation. Animal grazing is the prime land use over the remainder of the catchment.

5.2 Crown land

Approximately two-thirds of the Walpole Weir catchment is owned by the Crown, vested in different agencies and managed for a variety of purposes outlined below.

5.2.1 Department of Water land

Reserve 31501, to the north east of the Walpole River is vested in the Water and Rivers Commission (now the Department of Water), and managed for the purpose of water supply. The western portion is leased to DEC which operates an airstrip for forestry management purposes. This airstrip is used primarily for fire management.

DEC proposes that this reserve be vested in the Conservation Commission as part of the Walpole Wilderness Area (WWA). The *Walpole Wilderness Area and Adjacent Parks and Reserves Draft Management Plan* proposes this be managed as a Forest Conservation Area, and prescribes allowable activities such as firewood collection, wildflower picking, craftwood collection and beekeeping. However, timber production for commercial sawlogs would not be permitted.

5.2.2 Department of Environment and Conservation land

Over half of the Walpole Weir catchment falls within the WWA and is vested in the Conservation Commission, managed by DEC as National Park and State Forest. The Draft Management Plan for the WWA was released in September 2006, and outlines management for a number of National Parks and other reserves within the WWA. The Department of Water is providing feedback to DEC on this management plan to ensure provisions for the Walpole Weir and Butler's Creek Dam Catchment Areas.

Given the limited supply of water in a drying climate and the water quality challenges of these sources, the Department of Water recommends the DEC management plan prioritises protection of these water supply sources to protect public health and work with the Department of Health, Department of Water and Water Corporation to achieve this outcome.

Mount Frankland South National Park covers the north-western section of the Walpole Weir catchment, and was created in December 2004 as part of the Government's 'Protecting Our Old-Growth Forests' policy. The park contains areas of former regrowth production forests that were extensively roaded. DEC's focus for the management of this area will be protecting the natural values (and rehabilitating degraded areas), while accommodating recreation opportunities in accessible areas of the National Park.

DEC are proposing new Walpole Wilderness Discovery Centres, one of which, named Swarbrick, is nearing completion (toilets yet to be constructed – DEC has advised these will be hybrid systems discharging into a sealed vault to prevent contamination) and is located on the eastern edge of the Walpole Weir Catchment (see Figure 3). The Department of Water will work with DEC to ensure there is no degradation of the drinking water source in the remaining construction and ongoing operation of the Swarbrick WWA Discovery Centre.

There is a small area south-east of the weir within the Walpole catchment that is part of the Walpole-Nornalup National Park. The focus of DEC's management in this area is to protect biodiversity and manage the interactions of people with the park environment while improving knowledge and understanding of park values.

The remainder of DEC's land is currently managed as State Forest, and is proposed to be reserved as Forest Conservation Areas. DEC's management direction for these areas is to ensure that resource utilisation activities (such as firewood collection, craftwood collection and wildflower picking) are sustainable.

5.2.3 Shire of Manjimup land

The Shire of Manjimup operates a waste transfer site on Plain Road, south of the Walpole Weir. The area used for waste transfer is partially within the catchment area. A portion of this block was previously used as a rubbish burial site for Walpole.

Waste is likely to be predominantly household, construction and agricultural due to the surrounding land uses that would have used the rubbish burial site. Contaminated water from this site could reach the weir though groundwater flow. Details of management and monitoring of this site are included in Table 1. This waste transfer site is also part of the greater Walpole-Nornalup Inlet System.

5.2.4 Recreation

There are currently no formal or designated recreation areas within the Walpole Weir or Butler's Creek Dam catchment areas. Tourists and locals often pass through the area. With the introduction of the WWA Management Plan by DEC, this could increase tourist numbers, specifically around the proposed Swarbrick Discovery Centre site. Numbers could also increase through future land use changing to tourist-type developments in the long term.

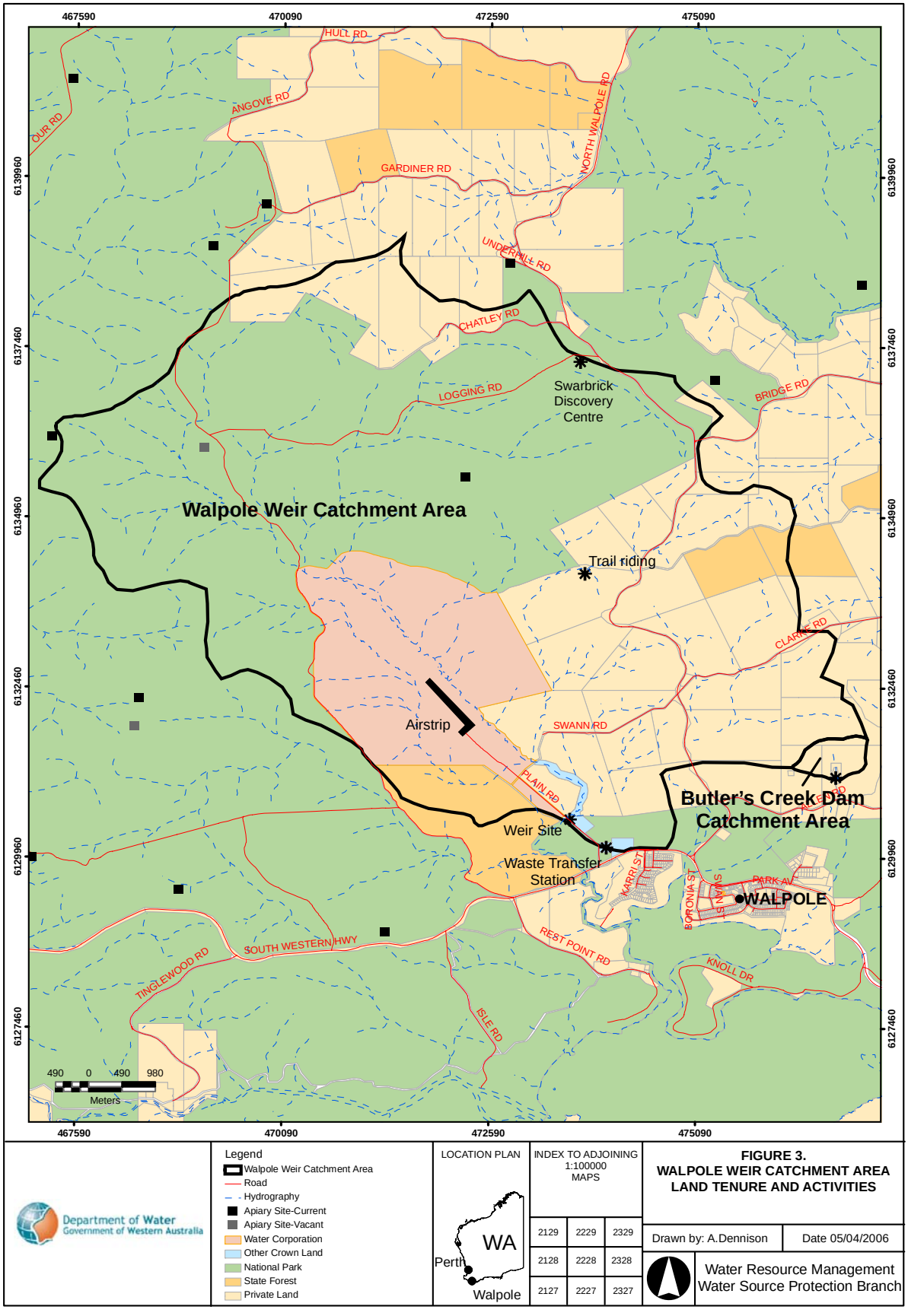

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Figure 3 Land use and activities in the Walpole Weir Catchment Area

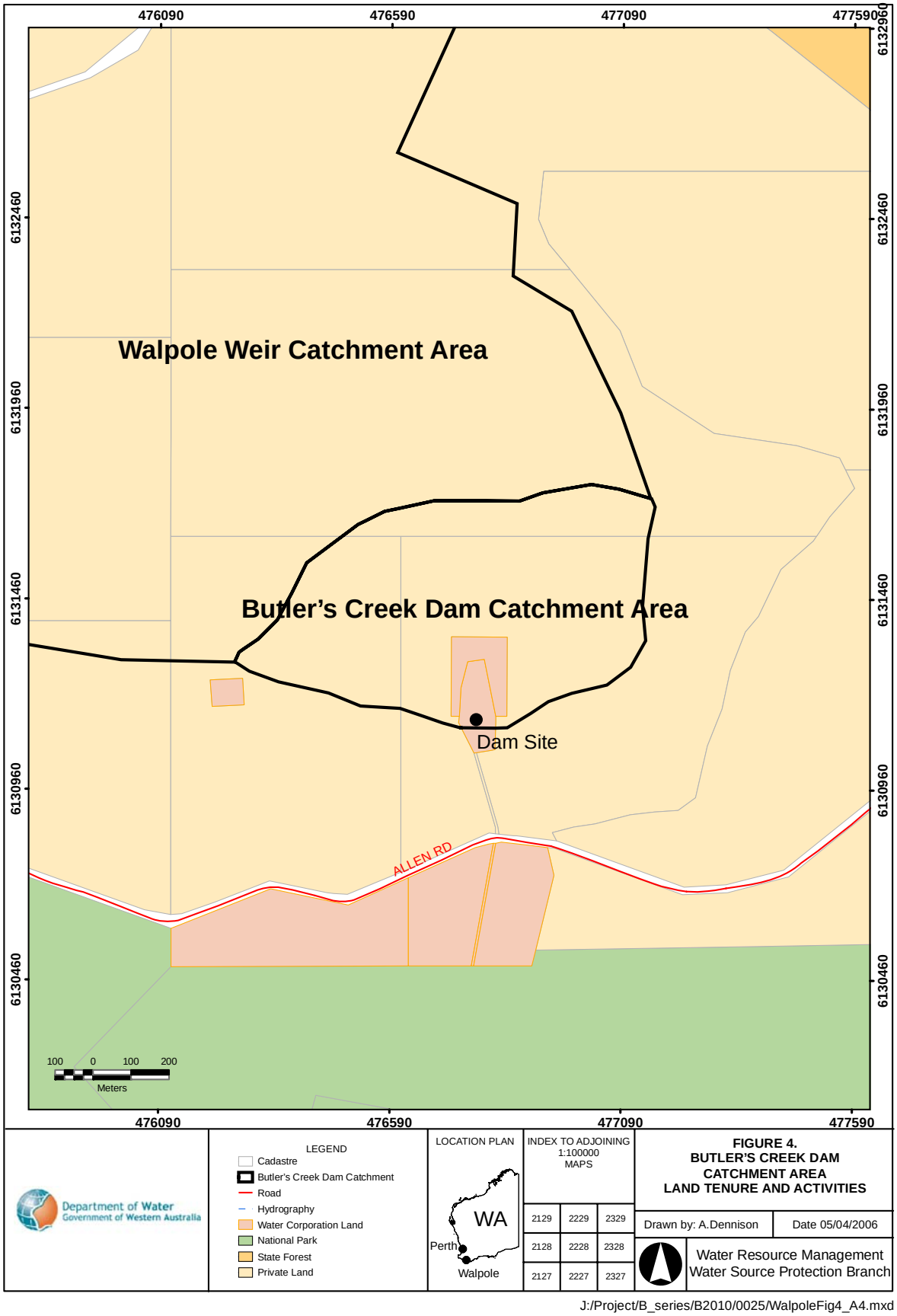

Figure 4 Land use and activities in the Butler's Creek Dam Catchment Area

6 Catchment protection strategy

6.1 Protection objectives

The objective of water source protection in both these catchments is to preserve water quality at its current level and where practical, achieve an improvement so as to provide a safe drinking water supply.

The Plan recognises the right of existing approved land uses to continue to operate in the catchments. The prevention, minimisation and management (in that order) of risks to water quality is imperative for the protection of public health.

6.2 Proclaimed area

The catchments of the Walpole Weir and Butler's Creek Dam have been defined from the physical drainage area by combining the most recent contour information with ground truthing. It is recommended these catchments be proclaimed as Catchment Areas under the *CAWS Act 1947* to ensure appropriate protection of the water supply sources.

6.3 Priority classifications

The protection of the Walpole Weir and Butler's Creek Dam Public Drinking Water Source Areas (PDWSAs) relies on statutory measures available in water resource management and land use planning legislation. The Department's policy for the management of PDWSAs includes three risk management based protection classification areas, Priority 1 (P1), Priority 2 (P2) and Priority 3 (P3).

P1 areas have the fundamental objective of risk avoidance. P2 areas have the consider risk minimisation, and P3 areas consider risk management. The Department's *Water Quality Protection Note - Land Use Compatibility in Public Drinking Water Source Areas* (see References) outlines activities that are acceptable, compatible with conditions, or incompatible with the different Priority areas.

The priority classification areas for PDWSAs are determined through the Drinking Water Source Protection Plan (DWSPP) process in consultation with State Government agencies, landowners, local government and other key stakeholders. The Priority areas for Walpole Weir and Butler's Creek Dam Catchments are a combination of Priority 1 and 2 areas as follows.

6.3.1 Priority 1 areas

All Crown land in the Walpole Weir catchment and the Water Corporation owned land in the Butler's Creek Dam catchment is classified for Priority 1 source protection (see Figures 5, 6 and 7). This classification is appropriate as:

- water from these sources constitutes a strategic supply to the town of Walpole so it should be afforded the highest feasible level of protection;
- retention time in the weir is negligible so there is little time for water quality improvement during storage; and
- existing land uses on the Crown land are considered compatible with Priority 1 objectives.

A small area of privately owned land adjacent to the Walpole Weir has the potential to be classified as P1 due to its proximity to the weir and waterlogged nature. Liaison between the affected landowner and the Department of Water will be ongoing to determine how this area can best be protected.

One option being considered is the sale of this land to the Department of Water. If this occurs the land would be classified P1 (see Figure 7). If not, other approaches may be negotiated to maximise the quality of water from this area (such as planting native vegetation).

6.3.2 Priority 2 areas

All remaining private land in the Walpole Weir and Butler's Creek Dam catchments and the Shire Waste Transfer Station are classified for Priority 2 source protection (see Figures 5, 6 and 7). This classification is appropriate as:

- water from these sources constitutes a strategic supply to the town of Walpole so should be afforded the highest feasible level of protection;
- land is freehold and zoned rural so the development rights are recognised; and
- existing land uses on private land can be managed for Priority 2 objectives with implementation of best management practices.

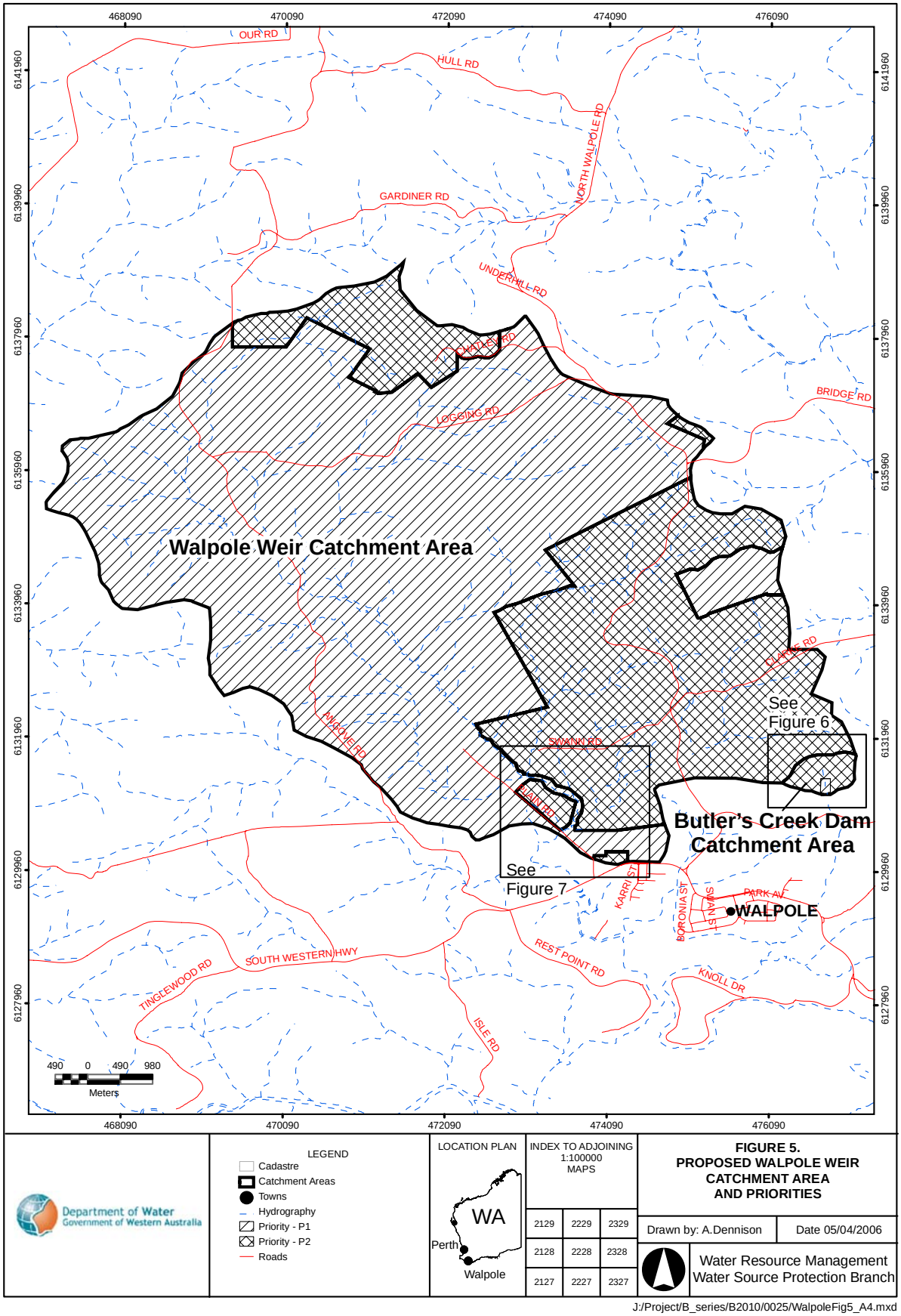

Figure 5 Priority classifications for Walpole Weir Catchment Area

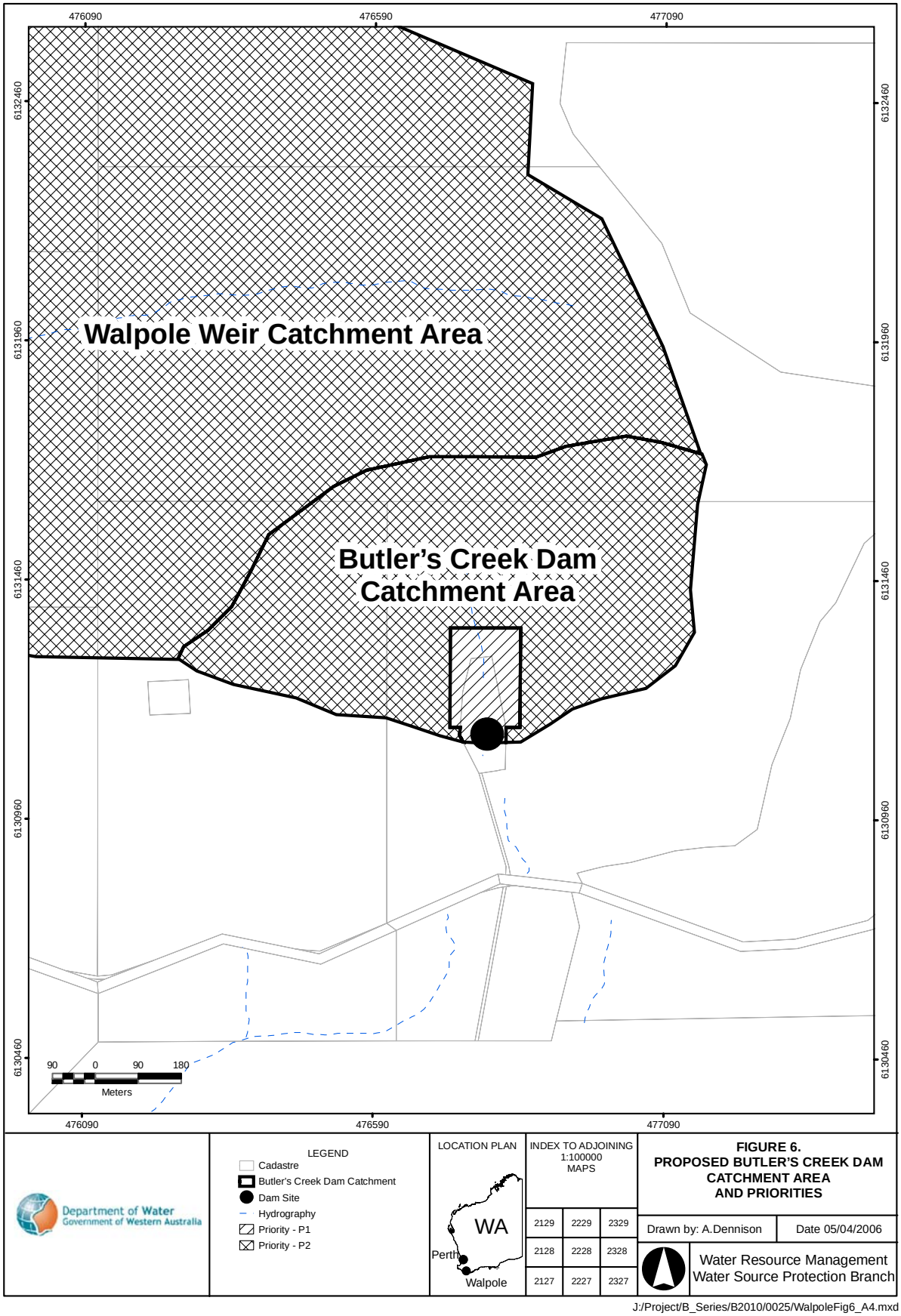

Figure 6 Priority classifications for Butler's Creek Dam Catchment Area

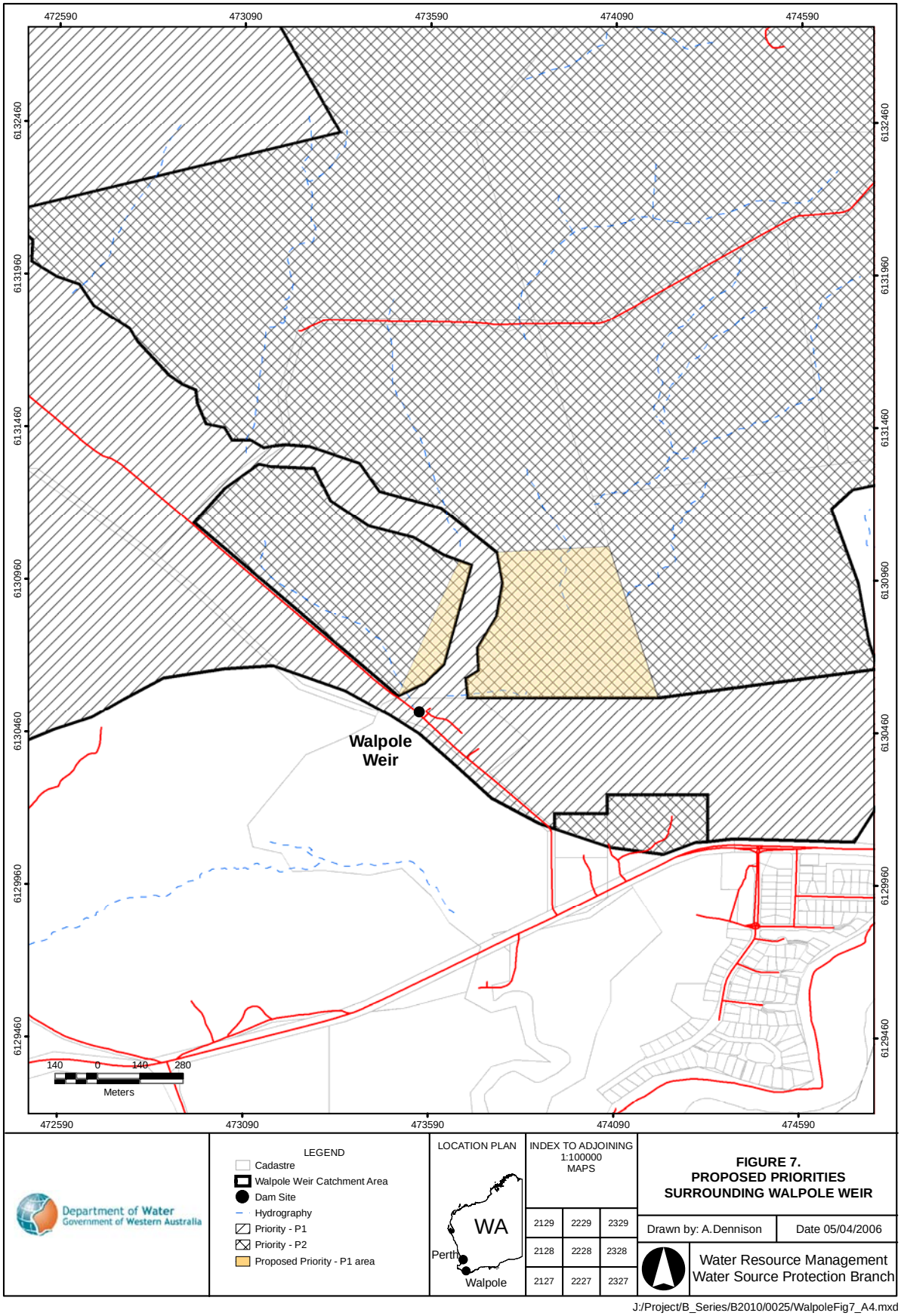

Figure 7 Enlargement of priority classifications adjacent to Walpole Weir

6.4 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 therefore appropriate that the Catchment Areas and priority classifications be recognised in the Shire of Manjimup's Town Planning Scheme. Any development proposals located within the catchments likely to affect water quality should be referred to the Department of Water for advice and recommendations. For guidance on the nature of land uses in P1 and P2 areas see the Department of Water's Water Quality Protection Note – *Land Use Compatibility in Public Drinking Water Source Areas* (see References).

6.5 Best management practices

There are opportunities to significantly reduce risks to water quality by carefully considering design and management practices. The adoption of best management practices for land uses will continue to be encouraged to help protect water quality.

To assist in the adoption of sound environmental practices, guidelines for specific industries are being progressively developed by Department of Water in conjunction with other agencies and the relevant peak industry body. Examples include dairy guidelines and recreation policy. These guidelines incorporate a practical, commonsense approach to environmental issues and are not intended to result in any unreasonable burden to industry. We recommend these guidance documents to landowners and managers as best practice for water quality protection (refer to References).

The Department has also 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 website (www.water.wa.gov.au > water quality > publications > water quality protection notes).

Education including signs and informative material is a key mechanism to highlight water quality protection measures to people, especially those visiting the area who are unfamiliar with the catchment.

On freehold land, we aim to work with landowners and managers on protection of PDWSAs to achieve best management practices for water quality protection through the provision of management advice, and assistance to seek funding if required.

6.6 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 supply catchments, as an important water quality protection mechanism. Surveillance and subsequent contact with visitors to the catchment is also important in raising the general level of awareness of the need to protect water quality.

Signs are erected in water supply catchments to advise of the catchment location, activities that are prohibited or regulated and other water quality protection measures. The Plan recommends delegation of catchment surveillance and By-law enforcement to the Water Corporation.

6.7 Emergency response

Escape of chemicals during unforeseen incidents and use of chemicals during emergency responses can result in water resource contamination. The Shire of Manjimup's Local Emergency Management Advisory Committees (LEMAC) through the Bunbury Emergency Management District should be familiar with the location and purpose of the Walpole Weir and Butler's Creek Dam Catchment Areas. A locality plan should be provided to the Fire and Rescue Services headquarters for the Hazardous Materials Emergency Advisory Team (HAZMAT). The Water Corporation should have an advisory role to any HAZMAT incident in the Water Weir and Butler's Creek Dam Catchment Areas. 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 Catchment Areas. These personnel should receive training to ensure an understanding of the potential impacts of spills on the groundwater resource.

6.8 Recommended protection strategies

Table 1 identifies the potential water quality risks associated with existing land uses in the Walpole Weir and Butler's Creek Dam Catchment Areas and recommends protection strategies to minimise these risks.

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

Activity	Potential Water Quality Risks/Threats	Consideration for management	Recommended Protection Strategies
Private Land			
Animal grazing, Horse riding, general farming activities	The water quality risks associated with animal grazing include: Pathogen contamination including Giardia and Cryptosporidium. Pesticide and chemical contamination (pasture). Nutrient contamination (grazing animals and fertiliser application). Turbidity (stock access to streams). General farming activities pose some risks through the potential for chemical and fuel contamination from the use of farm machinery, servicing, disposal and storage. Farms dams may have an accumulation of nutrients, pesticides and sediment and if a dam was to fail, it could potentially impact on drinking water quality.	Raw water from the Walpole Weir and Butler's Creek sources consistently contain high levels of microbiological contaminants associated with faecal matter. The Department recognises that use of private land in the catchments for agriculture is both an existing land use and essential for the livelihood of residents. Management of stock access to streams through fencing and establishing vegetated riparian buffers should be a priority as this would aid in protection and potentially improve the water quality by reducing the risk of turbidity and pathogen contamination. The existing land uses of stables (Horse trail riding) and stock grazing are compatible with conditions with the P2 classification.	*Private land to be classified for P2 source protection. Existing land uses to continue with use of best management practices (where applicable).* • Assist landowners to address risks of farm dams with funding where available through reconfiguration or building appropriate spillways. • Build upon existing restoration works carried out by landowners by providing expertise and funding where available to develop catchment and farm management plans including measures such as restoring riparian zones, fencing waterways, moving stock watering points out of waterways etc. • Ensure water quality protection objectives are recognised in the Shire of Manjimup Town Planning Scheme.

Activity	Potential Water Quality Risks/Threats	Consideration for management	Recommended Protection Strategies
Dwellings, Holiday Accommodation	Domestic septic systems, if not an adequate distance from streams, or not properly maintained, constitute a pathogen risk to water. Rubbish disposal could constitute a risk through leaching of contaminating substances.	Raw water from the Walpole Weir and Butler's Creek sources consistently contain high levels of microbiological contaminants associated with faecal matter. The Department recognises that use of private land in the catchments for agriculture is both an existing land use and essential for the livelihood of residents.	• Assist landowners to seek funding where available to relocate risky onsite sewage treatment systems to more suitable locations. • When systems are ready for replacement they should be upgraded with current systems that better protect water quality.
Plantations	Plantations pose a risk to water quality through leaching of fertilisers, pesticides, insecticides and potential drawdown of groundwater.	Plantations have the potential to locally draw down groundwater, thus contributing to reduction of inflow into the Walpole River during summer. Plantations are compatible with conditions with the P2 classification.	*Private land to be classified for P2 source protection. Existing land uses to continue.* • To further aid water quality protection, landowners will be encouraged to adopt best management practices.
Crown Land			
National Park and Forest Conservation Area	National Parks and Forest Conservation Areas are managed for conservation and generally do not pose a risk to water quality.	National Park is managed by DEC for conservation.	*Compatible land use with water quality objectives.* • Ensure the Walpole Wilderness Area management plan adapts water quality protection objectives.

Activity	Potential Water Quality Risks/Threats	Consideration for management	Recommended Protection Strategies
Walpole Wilderness Area – Swarbrick Discovery Centre	Attracting people to the catchment results in risk to water quality from potential fuel spills/accidents from vehicles, rubbish from people through use of walk trails, and potential contamination through public toilet systems.	The Swarbrick Discovery Centre is located on the edge of the P1 catchment area. The site is not large and visitors stay for short periods of time. The toilet is yet to be constructed, but DEC advise that it will be a hybrid system, with water discharge at 95 per cent original quality into a sealed vault to be pumped out annually.	*Compatible land use with conditions.* • Ensure the remaining construction and management plan for the Discovery Centre addresses water source protection objectives.
Roads and Tracks	Unsealed roads may contribute significant turbidity to the Walpole River. Sealed and unsealed roads present a risk to water quality through potential fuel spills/accidents. Angrove Road crosses the Walpole River several times. There are no roads in the Butler's Creek Dam catchment.	Tracks through the Walpole Weir catchment are necessary for timber and fire management by DEC. It is essential that tracks are well maintained to minimise risks to water quality. Roads and Tracks are necessary for forest management and require Best Management Practice	• Undertake a risk assessment survey of Shire and DEC roads, based on maintenance practices and transport of fuel/oil/chemicals • DEC and Shire to prepare plan for roads within the catchment to the satisfaction of the Department of Water. This may include consolidating and closing tracks/roads not required. • Manage roads in State forest in accordance with the relevant Codes of Practice. • Ensure sumps and runoff control measures are adequate.

Activity	Potential Water Quality Risks/Threats	Consideration for management	Recommended Protection Strategies
Fire Management	Maintenance of fire access tracks may cause some erosion. However, a serious wildfire would strip the land of vegetation, potentially resulting in significant erosion and turbid runoff into the river. Extraction of water from the river and watercourses for fire fighting could impact on water quality, as could the use of fire retardants foam in fire fighting.	Controlled burning and fire access track maintenance may pose some risk to water quality, but must be balanced with the potentially greater impact of a wildfire. Fire retardants contain nutrients. Waterways and their buffers should be considered before application.	*Accepted as a necessary activity in proper forest management.* • Ensure the burning program adheres to water quality objectives. • Establish specific points for accessing watercourses and the river for fire-fighting purposes.
Apiary/ Wildflower Picking/ Seed Picking/ Firewood and Craftwood Collection	The risk from these activities are potential pathogen contamination and litter through the presence of people near streams and the Walpole River and the risk of rubbish dumping as a precursor to casual firewood collection.	These activities can be managed so that people are not in close proximity to the river or feeder streams. The risk is further reduced as numbers of people involved are low. These activities are subject to conditional approval by DEC.	*Acceptable with controls such as licence conditions.* • Apply approval conditions for Apiarists, Wildflower Picking and Seed collection licences that meet water quality protection objectives. • Promote casual firewood collection in designated areas outside the catchment.
Feral animal control program	The poison used for fox baits is 1080, which is a naturally occurring poison derived from a native plant. The quantity of poison used is not considered to pose a risk to water quality, as the quantity naturally occurring in the catchment is far greater. The carcasses of poisoned animals may pose a risk of bacterial contamination. There are no reported problems associated with feral pig activity in the catchment.	Fox baits are not considered to have an impact on water quality.	*Fox Baiting is an acceptable activity in the catchment.* • Control fox numbers with 1080 through DEC program.

Activity	Potential Water Quality Risks/Threats	Consideration for management	Recommended Protection Strategies
Manjimup Shire Waste Transfer Station	The site was previously used as a land fill site until 1997. Buried rubbish is most likely household, agricultural, construction and light industry waste. The risk from such a site could include contamination from heavy metals, chemicals, and petroleum products.	The site is currently managed as a transfer station that holds waste before transfer to Manjimup. All material that could potentially cause a health or environmental risk is stored on a bunded area in covered bins. The Shire has planted Tasmanian blue gums on this site to prevent groundwater from moving away from this site, although earlier contamination in groundwater may have previously moved away from the site over time. Bi-annual water samples collected and recorded, revealing that water quality currently meets acceptable levels.	*Ensure risks from the site are minimised.* • Continue monitoring program to ensure contaminants do not enter drinking water, the Departments of Water and Environment and Conservation to advise and review monitoring programs. • Continue with rehabilitation of previous landfill site in consultation with the Shire, the Department of Environment and Conservation and the Department of Water. • Shire to prepare a management plan for the site and review water quality monitoring data and submit to the Department for review.
Airstrip	There is a potential for fuel contamination from spillage/accidents.	The airstrip is used regularly and fuel is stored on site in covered, bunded area. There are no fire retardants stored onsite. The land is currently vested in the WRC and leased to DEC.	*Acceptable land use activity with appropriate conditions.* • Ensure lease conditions include drinking water quality protection measures. • Proposal for changes of use should be referred to the DoW. Expansion would not be supported. • If vesting changes as per proposal in DEC's WWA Draft Management Plan, BMPs need to be continued.
Water Corporation Land			
Walpole Water Treatment Plant and headworks	A potential risk exists from the storage of chemicals on site, runoff from the sludge drying beds or spillage when servicing machinery.	The shed housing chemicals and the sludge drying beds have drains so that runoff enters Walpole River below the weir. Machinery servicing is not carried out on site.	*Acceptable with best management practices.* • Ensure current management to minimise water quality risks is maintained.

Activity	Potential Water Quality Risks/Threats	Consideration for management	Recommended Protection Strategies
Recreation			
Bushwalking and associated activities	There is a risk of pathogen contamination with people in the catchment, and there are no toilet facilities. Bushwalking tracks can provide access to watercourses. Recreational use of the catchment is limited.	There are other major tourist destinations in the region outside of the catchment. DEC is proposing a new Swarbrick Walpole Wilderness Discovery Centre with associated managed walk trails and toilet facilities provided. There is a potential for other recreation nodes to develop with increased usage of the area.	*Some recreation acceptable activity with Best Management Practices* • Bushwalking and picnicking are conditional activities in designated areas only in P1, swimming is incompatible with P1 according to Statewide Policy 13 (see References). • Use signage in the area as an education tool for water quality protection objectives. • Ensure proposed Swarbrick Discovery Centre plan addresses water quality protection objectives. • Establish future recreation nodes outside the catchment area.
Fishing	The potential risks from fishing are: pathogen contamination through human and pets contact with the water body, absence of toilet facilities, use of meat baits and rubbish disposal; turbidity through vehicle usage and fishing activity (ie. erosion of riverbanks and disturbance of streambeds).	Fisheries do not stock trout in the Walpole River within the Catchment Area. There is little known fishing occurring in the Walpole River due to shallow waters limiting boat access. Management measures should be implemented to minimise water quality risks.	*Incompatible activity in P1 area.* • Fishing is considered incompatible with P1 areas. • Establish surveillance to ensure compliance with protection measures.

Activity	Potential Water Quality Risks/Threats	Consideration for management	Recommended Protection Strategies
Marroning	The potential risks from marroning are: pathogen contamination through human contact with the water body, absence of toilet facilities, camping, use of meat bait and rubbish disposal; turbidity through vehicle usage and marroning activity (ie. erosion of riverbanks and disturbance of streambeds).	Marroning season occurs in the Walpole River for 2 weeks each year, the season is changeable. It is managed by Department of Fisheries. Outside the season, Fisheries investigate any reports of marroning in the area and maintain checks whilst in the area. Marroning can involve people staying for extended periods in the catchment and overnight camping is sometimes associated with the activity. Risks to water quality are increased when meat baits are used, rubbish is disposed, there is direct contact with the water, and when people spend extended periods in the catchment.	*Incompatible activity in P1 area.* • Marroning is considered incompatible with P1 areas. • Establish surveillance to ensure compliance with protection measures.

7 Recommendations

1 The Walpole Weir and Butler's Creek Dam Catchment Areas should be proclaimed under the *Country Areas Water Supply Act 1947*. (*Department of Water*)

2 The Shire of Manjimup Town Planning Scheme should incorporate this Plan and reflect the identified Catchment Area boundaries and Priority classifications. *(Shire of Manjimup)*

3 All development proposals located in the Catchment Areas that are likely to impact on water quality and/or quantity, or are inconsistent with *Water Quality Protection Note – Land use compatibility in Public Drinking Water Source Areas* or *Statement of Planning Policy No.2.7 – Public Drinking Water Source Policy* should be referred to the Department of Water for advice and recommendations. (*Department for Planning and Infrastructure, Shire of Manjimup)*

4 Signs should be erected along the boundaries of the Catchment Areas to define their location and promote awareness of the need to protect drinking water quality. Signs should include an emergency contact telephone number. (*Water Corporation*)

5 Incidents covered by WESTPLAN – HAZMAT in the Walpole Weir and Butler's Creek Dam Catchment Areas should be addressed through the following:

- The Shire of Manjimup Local Emergency Management Advisory Committee (LEMAC) is familiar with the location and purpose of the Catchment Areas.
- The locality plan for the Walpole Weir and Butler's Creek Dam Catchment Areas is provided to the Fire and Rescue headquarters for the HAZMAT Emergency Advisory Team.
- The Water Corporation provides an advisory role during incidents in the Walpole Weir and Butler's Creek Dam Catchment Areas.
- Personnel dealing with WESTPLAN – HAZMAT incidents in the area have ready access to a locality map of the Catchment Areas and training to understand the potential impacts of spills on drinking water quality.

(*Department of Water, Water Corporation)*

6 Implementation of surveillance and By-law enforcement should be delegated to the Water Corporation as the Government licensed water service provider for Walpole. *(Water Corporation)*

7 Review the water quality monitoring program in light of the identified risks to the water sources to ensure key characteristic parameters are included. Routinely review water quality analysis results to detect any increasing trends. *(Water Corporation)*

8 An implementation strategy for this Plan should be prepared involving all stakeholders. *(Department of Water)*

9 Implement the recommended protection strategies as detailed in *Table 1: Land use, potential water quality risks and recommended strategies* of this Plan. *(Applicable stakeholders)*

10 A review of this Plan should be undertaken after five years. (*Department of Water*)

11 The Department of Environment and Conservation's *Walpole Wilderness Area Management Plan* should ensure provisions for the protection of the Walpole Weir and Butler's Creek Dam Catchment Areas are addressed. *(Department of Environment and Conservation)*

12 The Department of Water liaise with affected landowners adjoining the Walpole Weir to determine how water quality can best be protected in these areas, including considering purchase options. *(Department of Water)*

Appendices

Appendix A Water quality

The information in this appendix was developed by the Water Corporation, Water Quality Branch.

The Water Corporation has monitored the raw (source) water quality from Walpole Weir and Butler's Creek Dam in accordance with the Australian Drinking Water Guidelines (ADWG) and interpretations agreed to with the Department of Health. The raw water is regularly monitored for:

- Aesthetic characteristics (non-health related)
- Health related characteristics
  - Microbiological contaminants
  - Health related chemicals

Following is data representative of the quality of raw water in Walpole River Weir and Butler's Creek Dam. The values are taken from ongoing monitoring from the period January 2001 to December 2006.

In the absence of specific guidelines for raw water quality, the results have been compared with ADWG values set for drinking water, which defines the quality requirements at the customers tap. 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. Barriers such as storage and water treatment, to name a few, exist downstream of the raw water to ensure it meets the requirements of ADWG. For more information on the quality of drinking water supplied to Walpole refer to the most recent Water Corporation Drinking Water Quality Annual Report at <www.watercorporation.com.au> > Publications > Annual Reports > Drinking Water Quality Annual Report.

Aesthetic related characteristics

Aesthetic water quality analyses for raw water from Walpole River and Butler's Creek Dam are summarised in the following table.

Aesthetic related detections for Walpole Weir and Butler's Creek Dam

Parameter	Units	ADWG Aesthetic Guideline Value*	Walpole Weir		Butler's Creek Dam	
			Range	Median	Range	Median
Aluminium acid soluble	mg/L	0.2	0.07 - 6	0.57	0.016 - 1.9	0.04
Chloride	mg/L	250	66 - 120	75	66 - 195	157.5
Colour - True	TCU	15	4 - >200	80	<1 - >200	5
Conductivity at 25^{o}C	mS/m	-	24 - 88	52	9 - 105	69.5
Hardness as CaCO3	mg/L	200	29 - 39	33	31 - 95	60
Iron unfiltered	mg/L	0.3	0.08 - 3	1.2	0.016 - 2.4	0.26
Manganese unfiltered	mg/L	0.1	<0.002 - 0.28	0.029	<0.002 - 3.8	0.028
pH measured in laboratory	NO UNIT	6.5 - 8.5	4.7 - 9.53	6.11	5 - 8.9	6.645
Sodium	mg/L	180	39 - 98	59	71 - 125	91
Sulphate	mg/L	250	6.5 - 115	10.5	7.5 - 115	20
Total filterable solids by summation	mg/L	500	195 - 345	262	259 - 425	342
Turbidity	NTU	5	0.6 - 39	7.6	0.2 - 13	1

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

Health related characteristics

Health parameters

Raw water from Walpole Weir and Butler's Creek Dam is analysed for health related chemicals including inorganics, heavy metals, industrial hydrocarbons and pesticides. Health related water quality parameters that have been measured at detectable levels in the sources between January 2001 and December 2006 are summarised in the following table.

Microbiological Contaminants

Microbiological testing of raw water samples from Walpole Weir and Butler's Creek Dam is currently conducted on a weekly basis. *Escherichia coli* counts are used as an indicator of the degree of recent faecal contamination of the raw water from warm-blooded animals. A count less than 20 most probably number (MPN) per 100 mL is typically associated with low levels of faecal contamination and is used as a microbiological contamination benchmark of the raw water (WHO, 1996). As such, counts less than 20 MPN are seen as being an indication of raw water that has not recently been contaminated with faecal material.

During the reviewed period of January 2001 to December 2006, positive *Escherichia coli* counts were recorded in 90.9 per cent and 68.6 per cent of samples from Walpole Weir and Butler's Creek Dam respectively. Approximately 78.8 per cent of samples from Walpole Weir and 37.8 per cent of samples from Butler's Creek Dam had *Escherichia coli* counts greater than 20 MPN/100mL.

The high bacteriological counts are attributed mainly to agricultural activities. Cattle stocking is prevalent in both catchments, with cattle able to access feeder streams for both sources.

Health related detections for Walpole Weir and Butler's Creek Dam

Parameter	Units	ADWG Aesthetic Guideline Value*	Walpole Weir		Butler's Creek Dam	
			Range	Median	Range	Median
Metals						
Barium	mg/L	0.7	<0.02 – 0.025	0.013	<0.02 – 0.13	0.035
Boron	mg/L	4	<0.02 – 0.06	0.02	<0.02 – 0.03	<0.02
Manganese unfiltered	mg/L	0.5	<0.002 – 0.28	0.029	<0.002 – 3.8	0.028
Inorganics						
Nitrite plus Nitrate as N	mg/L	11.29	<0.05 – 0.0555	<0.05	0.055 – 0.94	0.225
Sulphate	mg/L	500	6.5 - 115	10.5	7.5 – 115	20
Pesticides						
Dieldrin	µg/L	0.3	<0.004	<0.004	<0.004 – 0.012**	<0.004

* A health guideline value is the concentration or measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption (NHMRC & ARMCANZ, 1996).

** One detection only

Appendix B Photographs

Photo 1 Walpole Weir

Photo 2 Water flowing over Walpole Weir showing highly coloured nature of water

Photo 3 Land use in the Walpole Weir Catchment Area – horse grazing

Photo 4 Land use in the Walpole Weir Catchment Area – cattle grazing

Appendix C Summary of submissions

Table 2 is a summary of the submissions received from the 2000 release of the Draft Plan, the current status of that issue, and how they have been addressed in this current Plan. Table 3 reflects the submissions from the 2006 release of the Draft Plan.

Summary of submissions from the 2000 release of the Draft Plan

Issue raised	Current status	Response in Plan
Disposal of treated wastewater to tree lots at an as yet undefined location is a current Water Corporation strategy. Both surface and groundwater infiltration flows are incorporated in the utilised water resource; the Plan should define the risks and implementation strategies associated with this activity, relating these to the three priority categories.	The Water Corporation and their stakeholders are in discussions about their wastewater disposal project and the options available in the future. The Water Corporation will not be seeking sites for disposal within the Walpole or Butler's Creek Catchments as the land use is incompatible for the protection of water quality.	This is not addressed in the Plan, as it is not planned to dispose of wastewater within the Walpole Weir or Butler's Creek Dam Catchment Areas.
Reference to the long-term average rainfall was thought to be incorrect under the Climate section.	The 2000 Plan stated 1415mm average rainfall. The data was examined and agreed to be incorrect.	Section 2.1 of this plan states 1321mm long term average with drop to 1251mm since 1975.
Concern that options for an alternative source had not been investigated adequately.	Since the release of the draft plan in 2000, the Water Corporation has undertaken reviews of Walpole's town water supply.	Section 1.5 outlines the current Water Corporation position on future supply.
Concern that application of Priority source protection areas over private property will reduce future development potential.	Private land in the Walpole Weir and Butlers Creek Dam catchment areas is proposed for Priority 2 source protection. We recognise current land uses and allow these to continue whilst encouraging best management practices. All existing land uses are "compatible with conditions" according to the Department's Water Quality Protection Note Land Use Compatibility in Public Drinking Water Source Areas (refer References and Recommended Reading).	Section 4.1 of this document outlines private land use in the catchment areas. Section 5.2 addresses the Priority classifications.

Issue raised	Current status	Response in Plan
In the Shire of Manjimup's TPS, Lot 10221 on the north-eastern border of Walpole Catchment Area is zoned "Rural" and "Additional Use" which means "Holiday Accommodation" is permitted to a maximum of eight units.	The Priority 2 source protection area covers a portion of this lot. Bed and Breakfast/Rural chalet type operations are "compatible with conditions" in Priority 2 areas.	Added to section 4.1 of this plan, and Appendix 2.
The Plan mentions cattle-grazing as a land use, but some landowners also graze sheep and goats.	There are different types of animal grazing throughout the catchments.	Section 4.1 states "animal grazing" as the major private land use.

Summary of submissions from the 2006 release of the Draft Plan

Issue raised	Current status	Response in Plan
WANISAC has been disbanded.	Members of the ex-WANISAC group were consulted in the development of the 2006 Draft Plan.	Text has been changed in *Introduction* to reflect this.
Plantations significantly draw down the water table. Seepage inflow if vital in early autumn or late summer when the river can be a series of isolated pools. This is an essential consideration for management.		This has been added to Table 1 > *Private Land* > *Plantations.*
Blue gums will reduce groundwater flows away from the site but as inferred in section 5.2.3 they have no hope of preventing it down slope of the old tip site.	Tasmanian blue gums have been planted on the site to reduce groundwater flow away from the old tip. Some contaminants may have already left the site before the blue gums were planted.	This has been added to Table 1 > *Considerations for management* > *Crown land* > *Waste transfer station.*
Bi-annual water samples are collected and recorded for the waste transfer site, and results show that water quality currently meets accepted levels.	Sampling is done to monitor if there is any change in water quality from the old land fill site.	This has been added to Table 1 > *Considerations for management* > *Crown land* > *Waste transfer station.*
The creek that was diverted via a culvert under North Walpole Road could be returned to its original course, reducing contamination as water would no longer flow over pasture but through natural vegetation and help flush out the Walpole Inlet.	The diversion of the creek to its natural course will not be pursued at this time, given that the volume of water is required to keep up town water supply until such time as a new source is located.	N/A
The conversion of P2 to P1 on private land should not take place unless the land is purchased from existing owners.	The Department of Water is negotiating with existing landowners with regards to purchasing/leasing of P1 areas of land.	Figures 5 6 and 7 reflect the P1 and P2 areas.

Glossary

ADWG	The Australian Drinking Water Guidelines, outlining guideline criteria for the quality of drinking water in Australia.
Aesthetic guideline	NHMRC guideline level ascribed to acceptable aesthetic qualities of drinking water such as taste, smell, colour and temperature.
AHD	Australian Height Datum is the height of land in metres above mean sea level. For example this is +0.026 m at Fremantle.
Allocation	The quantity of water permitted to be abstracted by a licence, usually specified in kilolitres per year (kL/a).
ANZECC	Australian and New Zealand Environment Conservation Council.
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand.
Augment	To increase the available water within a storage dam by pumping back water from a secondary storage/reservoir 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 is a measure of pathogen contamination in water.
Diffuse source	Pollution originating from a widespread area eg urban stormwater runoff, agricultural infiltration.
EC	Electrical conductivity estimates the amount of total dissolved solids (TDS), or the total amount of dissolved ions in a solution (water) corrected to 25^{o} Celsius. Measurement units include milliSiemens per metre and microSiemens per centimetre.
Effluent	The liquid, solid or gaseous wastes discharged by a process, treated or untreated.
GL	Gigalitre (1 000 000 000 litres) or 1 million kilolitres
ha	Hectares (a measure of area)
HAZMAT	Hazardous Materials
Health	Australian Drinking Water Guideline value which is the concentration of

guideline	measure of a water quality characteristic that, based on present knowledge, does not result in any significant risk to the health of the consumer over a lifetime of consumption (NHMRC & NRMMC 2004).
HU	Hazen unit is a measure of water colour.
Hydrogeology	The study of groundwater, especially relating to the distribution of aquifers, groundwater flow and groundwater quality.
kL	Kilolitres (1000 litres)
km	Kilometres (1000 metres)
km^2	Square kilometres (a measure of area)
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.
LEMAC	Local Emergency Management Advisory Committee
m	Metres
mg/L	Milligrams per litre (0.001 grams per litre)
ML	Megalitres (1 000 000 litres)
mm	Millimetres
MPN	Most probable number (a measure of microbiological contamination).
mSv	Millisievert is a measure of annual radiological dose, with a natural dose equivalent to 2mSv/yr.
mS/m	MilliSiemens per metre is a measure of electrical conductivity of a solution or soil and water mix that provides a measurement of salinity.
NHMRC	National Health and Medical Research Council
NTU	Nephelometric turbidity units are a measure of turbidity in water.
Nutrient load	The amount of nutrient reaching the waterway over a given timeframe (usually per year) from its catchment area.
Nutrients	Minerals dissolved in water, particularly inorganic compounds of

	nitrogen (nitrate and ammonia) and phosphorous (phosphate) which provide nutrition (food) for plant growth. Total nutrient levels include the inorganic forms of an element plus any bound in organic molecules.
Pathogen	A disease producing organism. Disease producing organisms that can cause disease through the consumption of water which include bacteria (such as Escherichia coli), protozoa (such as Cryptosporidium and Giardia) and viruses.
Pesticides	Collective name for a variety of insecticides, fungicides, herbicides, algicides, fumigants and rodenticides used to kill organisms.
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 (PDWSA)	Includes all underground water pollution control areas, catchment areas and water reserves constituted under the *Metropolitan Water Supply Sewerage and Drainage Act 1909* and the *Country Areas Water Supply Act 1947*.
Reservoir	A reservoir, dam, tank, pond or lake that forms part of any public water supply works
Run of the river scheme	A scheme that takes water from a flowing river. Water is taken directly from the source and there is no detention time (storage).
Run-off	Water that flows over the surface from a catchment area, including streams.
Scheme supply	Water diverted from a source or sources by a water authority of 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.
TCU	True colour units (a measure of degree of colour in water)

TDS	Total dissolved salts, a measurement of ions in solution, such as salts in water.
Treatment	Application of techniques such as settlement, filtration and chlorination to render water suitable for specific purposes including drinking and discharge to the environment.
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.
WESTPLAN HAZMAT	Western Australian Plan for Hazardous Materials.

References

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Contributors

This report was prepared by:

Contribution	Personnel	Title	Organisation
Supervision	Stephen Watson	Program Manager, Water Source Protection	Department of Water
	Naomi Arrowsmith	Regional Manager, South Coast Region	Department of Water
Report Preparation	Kathryn Buehrig	Water Resource Planner, Water Source Protection	Department of Water
	Brett Ward	Program Manager, South Coast Region	Department of Water
	Genevieve Mannin	Scientific Officer	Water Corporation
Drafting	Andrew Dennison	GIS Officer	Department of Water
	Melanie Webb	GIS Officer	Department of Water