WRP 22

GOVERNMENT OF WESTERN AUSTRALIA

ESPERANCE WATER RESERVE
WATER SOURCE PROTECTION PLAN

Esperance Town Water Supply

WATER RESOURCE PROTECTION SERIES

WATER AND RIVERS COMMISSION REPORT WRP 22
1999

WATER AND RIVERS
COMMISSION

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Cover Photograph: Esperance coastline

ESPERANCE WATER RESERVE
WATER SOURCE PROTECTION PLAN

Esperance Town Water Supply

Water and Rivers Commission
Policy and Planning Division

WATER AND RIVERS COMMISSION
WATER RESOURCE PROTECTION SERIES
REPORT NO WRP 22
1999

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Foreword

Water Source Protection Plans

Water Source Protection Plans establish the level of protection required within Water Reserves. The 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 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 Water Reserve at Esperance 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 this groundwater resource 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 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 some development is allowed under specific guidelines.

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, well-head protection zones and reservoir protection zones are defined to protect the water source from contamination in the immediate vicinity of production wells 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 restrictions apply within these zones.

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Summary

Esperance is a regional centre and tourist town on the south coast of WA, about 600km southeast of Perth. The public drinking water supply for Esperance comes from Water Corporation wells, screened in the Quaternary sediments, west of Esperance and in the town area. This shallow unconfined aquifer is recharged directly from rainfall, and is vulnerable to contamination from inappropriate land uses.

A 1992 report entitled "Esperance Water Reserve Protection of Groundwater Quality" (Hughes-Owen, 1992) recommended major changes to the existing Water Reserve boundary. Although the changes were endorsed, the proposed boundary was never proclaimed. Consequently, the original boundary, encompassing a larger area, remains as the legal entity. This Water Source Protection Plan recommends similar boundaries and priority zones to the 1992 report.

There are a variety of land uses within the Water Reserve. This necessitates differential protection of areas within the Water Reserve. Most of the Water Reserve is in Crown ownership and should be managed for Priority 1 source protection. The remaining areas are in private ownership, and recommended for either Priority 2 or Priority 3 source protection.

Water quality should be regularly monitored for pollutants where there is a risk of contamination from land uses.

Development proposals that may affect the quality of the water source should be referred to the Water and Rivers Commission.

1. Introduction

Esperance is located on the south coast of WA approximately 600km southeast of Perth (see **Figure 1**). The public drinking water supply for Esperance comes from Water Corporation wells, screened in the Quaternary sediments, west of Esperance and in the town area. This shallow unconfined aquifer is recharged directly from rainfall, and is vulnerable to contamination from inappropriate land uses. A variety of land uses are present within the Water Reserve necessitating differential protection of areas within the Reserve.

The population of Esperance, currently about 11 000, is expected to increase greatly. The town is the regional centre for agricultural industries, and has an increasingly busy port, which services agricultural and mining industries. Esperance is a popular tourist location and retirement town. Demand for potable water will continue to grow.

This report provides a Water Source Protection Plan for the aquifer used for the Esperance Town Water Supply. The Plan establishes the level of protection required within drinking water source areas. The Plan identifies risks of contamination to water that should be investigated, and sets out programs to manage protection of the resource.

2. Physiography

The climate of the region is of Mediterranean type, with hot dry summers, and mild wet winters. The long-term average annual rainfall is 617mm. Most rainfall occurs during the winter months from May through to October. The rainfall has been about 10% below the long-term average since 1990.

The southern coastline of the Esperance area consists of rocky headlands and intervening stretches of sandy beaches. A series of lakes which contain brackish to saline water occur in the coastal area. Coastal dunes extend west from Esperance to Lake Gore. The sand dunes range in elevation from 10 m AHD to more than 100 m AHD.

3. Hydrogeology

The hydrogeology of the area has been detailed by the Water Corporation (1998a) and Johnson (1998). The following discussion is a summary of those reports.

Groundwater occurs within the Quaternary sediments under unconfined conditions and within the Tertiary Werillup Formation under confined conditions, with the Tertiary Pallinup Siltstone as the upper confining layer. The Werillup Formation rests on weathered granitic basement rocks.

The Esperance town water supply is sourced from the unconfined aquifer within the coastal Quaternary sediments west of Esperance. Groundwater in the unconfined aquifer generally has a salinity less than 1000 mg/L. Groundwater in the Werillup Formation is brackish to saline with salinity ranging from 2000 mg/L to 7500 mg/L TDS.

The unconfined aquifer is the largest source of potable groundwater in the region, and extends along the coastline and up to approximately 10 km north of the coast. The depth to groundwater is between 5 and 95 m, depending upon the topography. The unconfined aquifer is highly vulnerable to contamination.

The sediments generally comprise shelly, fine to coarse-grained quartz sand overlain by dune deposits of sand and calcareous arenite. The saturated thickness of the Quaternary sediments is generally 20-30 m, but is more than 50 m thick north of Butty Head. In an area of basement high, west of Pink Lake, the sediments are unsaturated.

Groundwater flow within the Quaternary deposits is subdivided into two systems by the buried basement high west of Pink Lake. Groundwater in the eastern area (Esperance flow system) flows from a mound crest to Pink Lake or toward the coast, while in the western area (Gore flow system) groundwater flow is toward the coast or to the Lake Gore/Lake Mortijinup wetland system (Water Corporation, 1998a). The saturated zone is up to 30 m thick in the Esperance flow system. In the Gore flow system, the maximum saturated thickness of the aquifer exceeds 50 m.

The watertable configuration shows groundwater mounds between Pink Lake and the coast, and west of the Pink Lake where the watertable elevation exceeds 50 m AHD with a steep hydraulic gradient towards the coast. Near the town area the watertable is less than 0 AHD, due to groundwater abstraction. The interpreted pre-pumping watertable elevation in this area was between 3 m and 4 m AHD.

Groundwater in the Quaternary sediments is generally fresh. However, brackish to saline groundwater occurs south of Pink Lake due to concentration of salts in the lake by evaporation and its subsequent flow towards the coast under density gradient. Lateral movement of this saline groundwater plume does not take place because of the bedrock ridges and the hydraulic gradient of the regional groundwater flow.

The groundwater is recharged by infiltration of rainfall into the sediments. Previous modelling assumed the recharge to be 22.5% of rainfall (Ventriss, 1981). Baddock (1994) used the chloride ratio method to estimate that recharge varied between 10% and 50%, depending upon vegetation cover. The highest recharge rate (approximately 300 mm/year) occurs in the dune blow out areas, which occur extensively west of Esperance. Groundwater discharges into the ocean and to the coastal lakes.

4. Scheme description

The Esperance town water supply wellfield consists of 35 production wells located within and to the west of Esperance drawing from the Quaternary aquifer. The locations of the production wells are shown on **figures 4 and 5**. Ten of these wells are used sparingly due to increasing salinity problems. Two others are in poor condition and also used sparingly. Four new production wells have been installed south west of Pink lake.

The Scheme is licensed by the Water and Rivers Commission to extract up to 2200 ML/year. The annual abstraction from the wellfield since 1989/90 has averaged about 1650 ML/year, and shows a steady increase. Population growth within Esperance is likely to increase water demand. The Water Corporation estimates that demand could increase to 2200 ML/year by 2001 (Water Corporation, 1998b).

Other users also abstract water from the aquifer. The Water and Rivers Commission currently allocates a total of 3118 ML/year for abstraction by Water Corporation, Local Government and private users. There are also a significant number of unlicensed users. This is being addressed in the Esperance Allocation Plan.

Production wells near the town area have experienced declining water levels since 1981. The watertable has declined below sea level near well 23. This is thought to have induced saltwater intrusion from the sea (Baddock, 1994).

Increased salinities have been recorded at several wells within the urban areas of the wellfield, possibly due to saline upconing or salt water intrusion. In 1997 Water Corporation installed five monitoring bores near the town area to detect and monitor the movement of the saltwater interface near the wellfield.

Wells south of Pink Lake also yield groundwater of higher salinity due to upconing of the lower saline groundwater during pumping.

The wellfield's water quality generally conforms to the NHMRC & ARMCANZ 1996 guidelines

Contamination by the herbicide, atrazine, has been reported in the wellfield by Sheridan (1991). The concentrations were below the Australian Drinking Water Guidelines (NHMRC & ARMCANZ, 1996). Concentrations of atrazine have decreased since 1991. The Water Corporation continues to monitor atrazine concentrations in production wells.

Nitrate concentrations up to twice the NHMRC & ARMCANZ (1996) guideline level were detected at some public water supply wells within the townsite in the early 1990s. Nitrate concentrations have since decreased at these wells, probably due to the installation of a reticulated sewerage system in mid to late 1980s. The nitrate plume has apparently spread south westerly, towards wells 9 and 21 (Water Corporation, 1998a).

Increased demand for potable water and upconing of saline water in wells south of Pink Lake have necessitated extension of the wellfield. Extension of the Esperance wellfield to the west is planned.

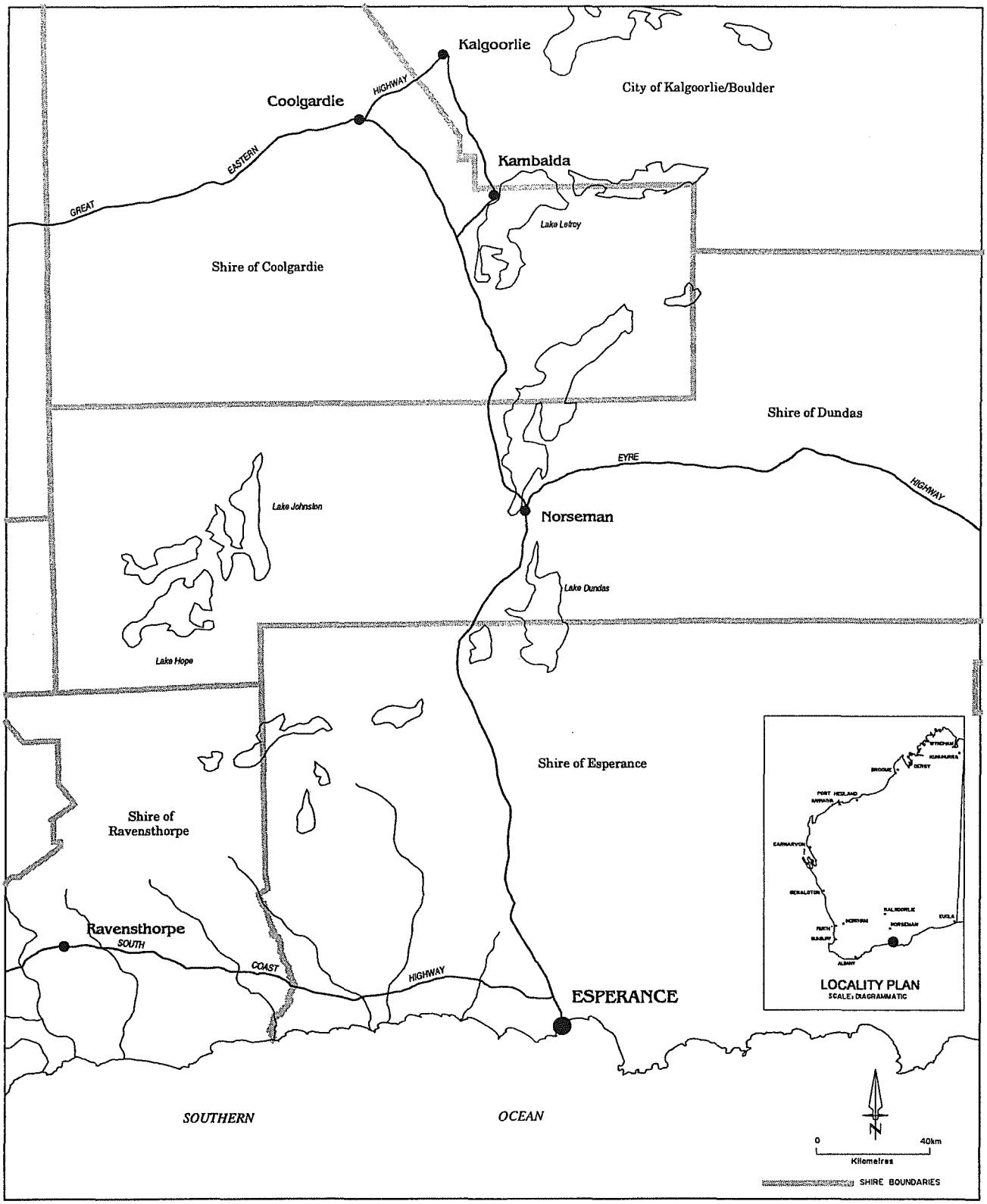


Figure 1. Esperance locality map

5. Existing and proposed land use

Current land zonings, and the existing and the 1992 proposed Water Reserve boundaries are shown in **Figure 2**.

Existing land uses

Urban and associated development
Urban development is established at the eastern end of the area. The area was sewered in the mid to late 1980s. There is a small commercial, retail centre on Pink Lake Road. The centre includes a service station and a dry cleaning shop.

Industrial
Western Power has a diesel-fired power station near well 16. The Water Corporation intends to close well 16, located beside the power station, during 2000/01. The power station is a potential source of groundwater contamination. Such contamination could pose a risk to private water supplies.

The CSBP fertiliser plant and the Esperance Port Authority facilities are outside the Water Reserve boundary proposed in 1992 (to the northeast and southeast respectively).

The industrial area is close to the northeastern corner of the Water Reserve.

Cemetery
A cemetery is located approximately 1 km east of Pink Lake, north of Pink Lake Road.

Golf course
A golf course is located immediately southeast of Pink Lake.

Special Rural
Significant areas immediately west of the Esperance town site are zoned special rural. The Shire of Esperance Town Planning Scheme sets a minimum lot size of 4 Ha in this area, unless sanctioned otherwise by the Water and Rivers Commission. Several 2 Ha lots were established some time ago.

Several of the special rural lots carry significant numbers of horses.

Rubbish disposal site
An abandoned rubbish disposal site is located west of the cemetery on Pink Lake Road.

Rural
There are substantial areas of rural land within the Water Reserve, near Pink Lake, and Lake Gore at the western end of the Water Reserve. Most of the rural land near Pink Lake is subject to a proposed Limited Rural Strategy. The Limited Rural Strategy rezones the land to allow special rural land uses. Groundwater protection was identified as a major planning consideration. A minimum lot size of 5 Ha is recommended within the Limited Rural Strategy.

Reserves
The Butty Harbour Nature Reserve occupies most of the western half of the Water Reserve. CALM may seek inclusion of nearby vacant crown land into the Nature Reserve. This initiative meets the Commission's source protection objectives, however must recognise the Water Corporation's requirements for access to develop and maintain water production infrastructure.

A number of other nature reserves are also within the Water Reserve.

Reserve 1976 is designated for recreational use of trailbikes and dune buggies. It is vested with the Shire of Esperance.

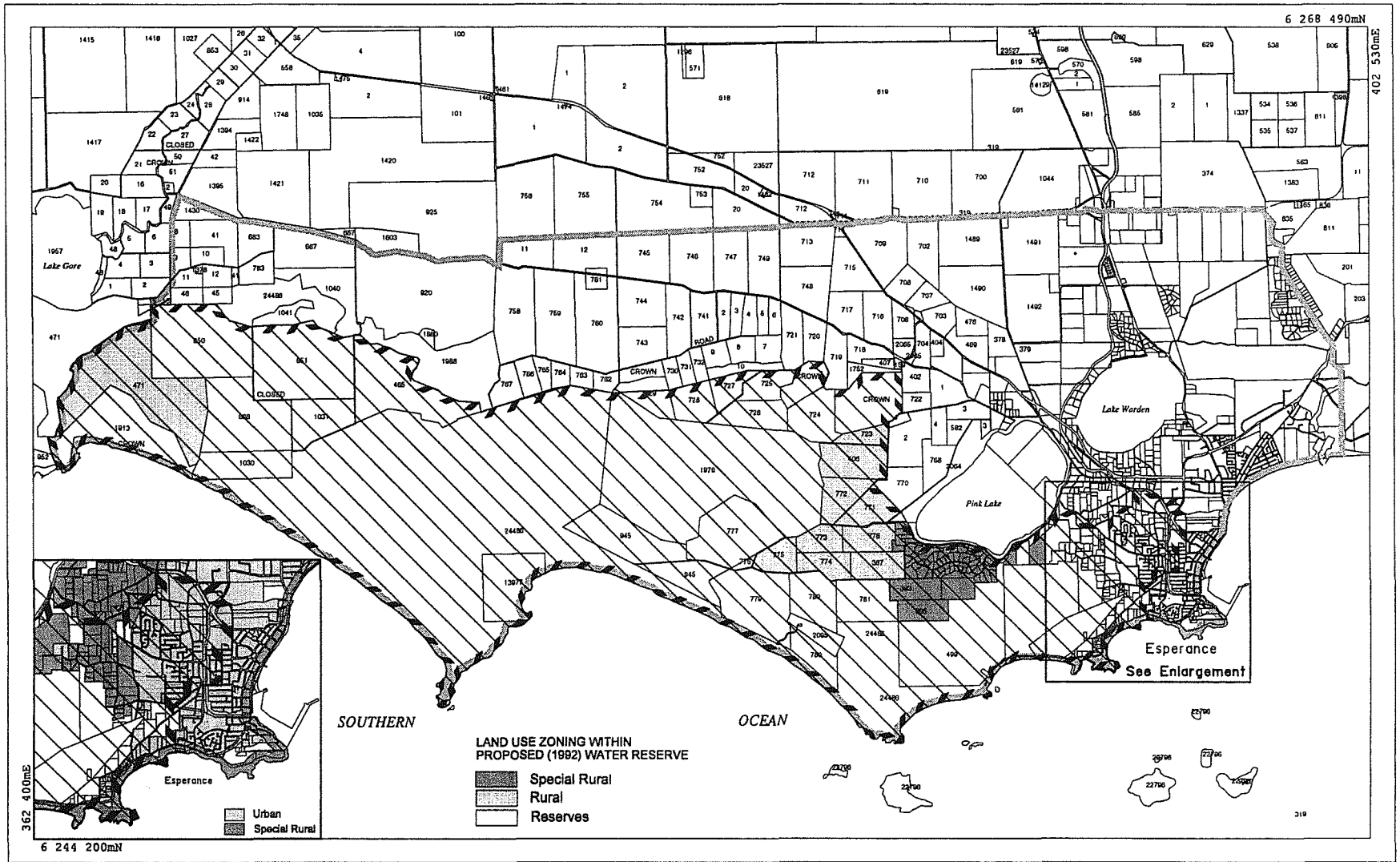
Rifle range
A rifle range is located southwest of the town, near the coast.

Potential land uses

Urban Development

The land to the north of the urban area, at the eastern end of the Water Reserve (1992 proposal), is zoned for future urban development. The Shire of Esperance expects this area to become fully developed. Reticulated sewerage will be required.

Special Rural Development
There are pockets of Vacant Crown Land between Esperance and Pink Lake, in the area zoned special rural. There is potential for these to convert to freehold titles.



WATER AND RIVERS COMMISSION

1 0 1 2 3 4km
Scale

LEGEND:

Existing water reserve boundary

Proposed water reserve boundary-1992

INDEX TO ADJOINING 1:100000 MAPS		
3131	3231	3331
3130	3230	3330
	3229	3329

FIGURE 2.
ESPERANCE WATER RESERVE LAND USE

Drawn by N.J.A. Date 15/05/98

Policy and Planning Division
Water Quality Protection Branch

6. Potential for contamination

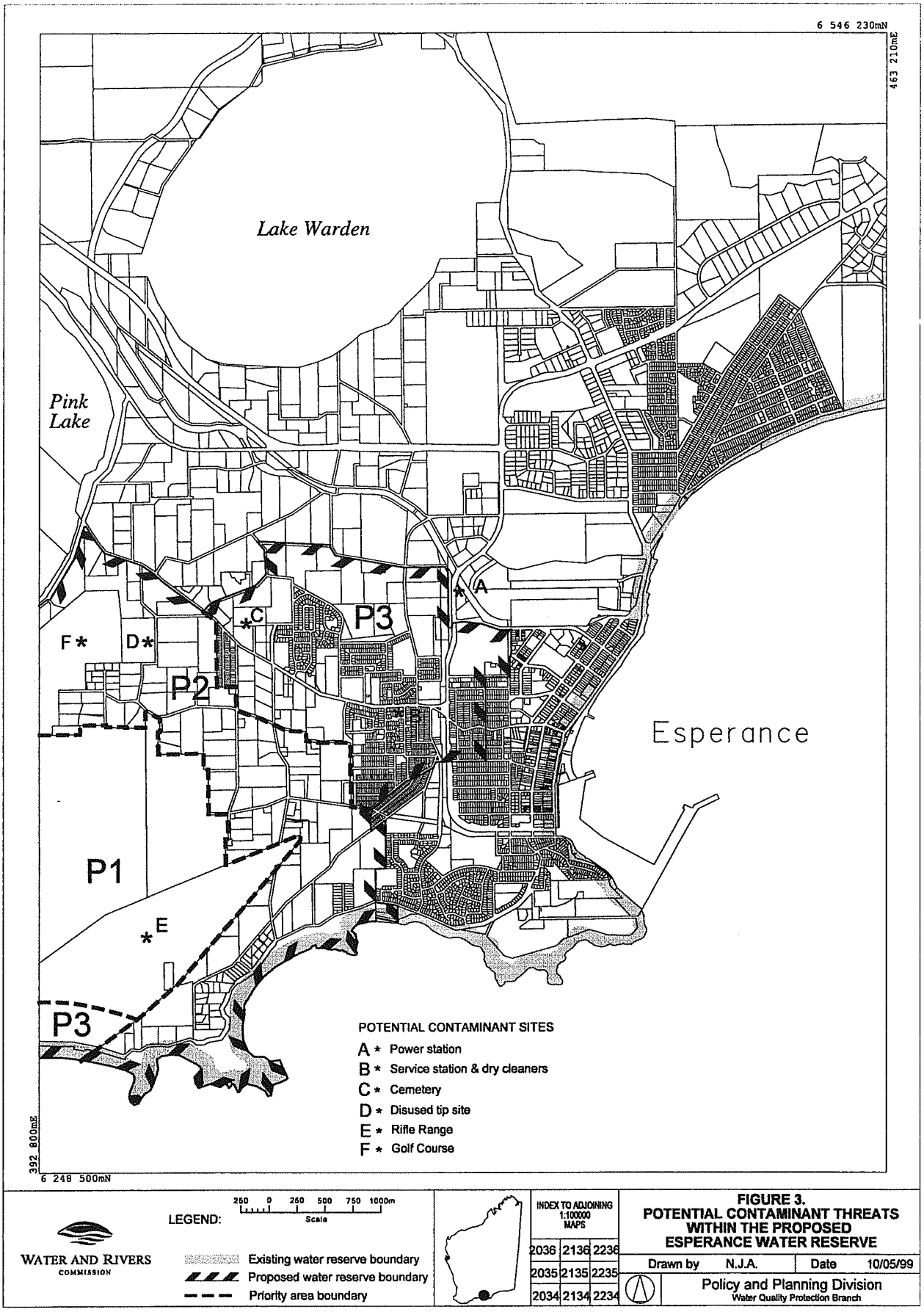
The aquifer is vulnerable to contamination because it is shallow and unconfined. **Figure 2** shows broad land uses that may cause contamination. **Figure 3** shows potential point sources of contamination within the recharge area. Following is a table of land uses having the potential to contaminate the aquifer. The map reference is to **figure 3**, except where indicated.

Table 1. Potential sources of contamination within the Esperance Water Reserve

Map ref.	Issue	Risks/Threats	Potential Impact	Likelihood	Current Preventative Measures	Suggested Protection Measures
A	Diesel-fired power station	Large volumes of diesel stored in above ground tanks.	High	Moderate	Bunding and waste water / oil separation treatment. W Corp plans to close production well 16.	• Close production well 16. • Negotiate further upgrading of Western Power facilities as necessary. • Monitor nearby production wells for indications of contamination. • Emergency response process.
B	Service station	Storage of fuels in underground storage tanks. Refuelling operations and transport of fuel.	High	High	Unknown	• Assess the integrity of storage tanks and hydrocarbon waste disposal systems. Negotiate upgrades as appropriate. • Monitor nearby production wells for indications of contamination. • Emergency response process.
B	Dry cleaners	Storage and disposal of dry cleaning solvents such as trichloroethene.	High	Moderate	Unknown	• Investigate waste disposal and storage of chemicals. Negotiate upgrades as appropriate. • Monitor nearby production bores for indications of contamination. • Emergency response process.

Map ref.	Issue	Risks/Threats	Potential Impact	Likelihood	Current Preventative Measures	Suggested Protection Measures
C	Cemetery	Nitrate contamination	Low	Moderate	None	None
D	Disused tip site	• Received all waste until 1990. Contains hydrocarbons and nightsoil. • Risk of contamination if groundwater flow direction changes	Moderate	Low	Monitoring groundwater levels.	Monitor groundwater levels in production wells and observation bores to detect changes in groundwater flow direction.
E	Rifle range	• Contamination from wastewater disposal. • Lead contamination.	Low	Low	Unknown	Proposals for expansion of the facility should be carefully assessed.
See **Fig 2.**	Urban land use	• Nitrate and microbiological pollution from onsite waste water disposal. • Contamination by chemicals used and stored in urban areas (eg. pesticides, petroleum products). • Roads - contaminated runoff and chemical spills.	Moderate	High	Regular monitoring of water quality from production wells.	• Planning strategies to incorporate Water and Rivers Commission management principles. • Education through signage and written material. • Continue monitoring production wells for contamination. • Emergency response process.
See **Fig 2.**	Special rural zoned land	• Nitrate and microbiological pollution from onsite wastewater disposal and overstocking. • Contamination by chemicals used and stored (eg. Pesticides, petroleum products).	Moderate	Moderate	Planning and development constraints.	• As for urban land use. • Avoid overstocking through use of appropriate clauses within the Esperance Town Planning Scheme. • Planning strategies to incorporate Water and Rivers Commission management principles. • Education through signage and written material.

Map ref.	Issue	Risks/Threats	Potential Impact	Likelihood	Current Preventative Measures	Suggested Protection Measures
See **fig 2**	Off road vehicles on Reserve 1976	Hydrocarbon contamination from refuelling or servicing vehicles.	High	Low	Unknown	• Education through signage. • Surveillance to determine whether high-risk activities occur.


6 546 230mN
463 210mE
Lake Warden
Pink Lake
Esperance
P1
P2
P3
P3
A
B
C
D
E
F
POTENTIAL CONTAMINANT SITES
A * Power station
B * Service station & dry cleaners
C * Cemetery
D * Disused tip site
E * Rifle Range
F * Golf Course
392 800mE
6 248 500mN
LEGEND:
250 0 250 500 750 1000m
Scale
Existing water reserve boundary
Proposed water reserve boundary
Priority area boundary
WATER AND RIVERS COMMISSION
INDEX TO ADJOINING 1:100000 MAPS
2036 2136 2236
2035 2135 2235
2034 2134 2234
FIGURE 3.
POTENTIAL CONTAMINANT THREATS WITHIN THE PROPOSED ESPERANCE WATER RESERVE
Drawn by N.J.A.
Date 10/05/99
Policy and Planning Division
Water Quality Protection Branch

7. Proposed proclaimed area

The existing Water Reserve was gazetted in 1970 (**Figure 4**). It incorporates areas of land to the north and east of the wellfield, including large areas outside the water bearing Quaternary sediments.

A Water Source Protection Plan was prepared for Esperance in 1992 (Hughes-Owen, 1992). The plan contained recommendations for major changes to the Water Reserve boundary. They were to realign the boundary to follow the edge of the Quaternary sediments and remove the unnecessary constraint upon land east of the capture zone of the current wellfield. The Water Reserve proposed in 1992 is shown in **Figure 2**.

Although these recommendations were accepted, the recommended boundary was never proclaimed.

The reserve boundary proposed in 1992 is appropriate, as it encompasses the recharge area for the existing wellfield, and allows protection of the likely areas for further wellfield development.

One minor change is recommended. The Water Corporation plans to decommission production well 16. It is susceptible to potential contamination from the adjacent power station and urban development. After the well is decommissioned, the Water Reserve boundary should be rationalised to exclude the Power Station and urban areas beyond the wellfield's estimated capture zone.

Figure 4 shows the proposed Water Reserve boundary and the priority areas within the reserve. **Figure 5** provides greater detail of the eastern end of the proposed Water Reserve, near the townsite.

The Water Corporation plans to further rationalise its wellfield. As wells within the urban areas become non-operational it is likely they will be replaced with wells in the western areas of the Water Reserve. This will provide opportunities for further rationalisation of the Water Reserve in the urban area.

Priority Areas

The Water and Rivers Commission has developed a differential approach towards the protection of Public Drinking Water Source Areas. This approach is based on three levels of priority classification. The levels of protection are described in **Appendix 1**.

There are a variety of land uses within the Water Reserve, requiring different levels of water source protection.

Priority 1 classification is recommended over much of the current wellfield and areas identified for future extensions to the west. This is appropriate as:

- the groundwater resource is of strategic importance to Esperance
- the Water Reserve is an important recharge area for the aquifer
- the aquifer is highly vulnerable to contamination,
- the land is Crown owned
- the current land uses and zonings are compatible with Priority 1 source protection, and there is no current risk of contamination.

Areas zoned for special rural and rural uses within the water reserve require protection as Priority 2 areas. This level of protection will ensure there is no increased risk of pollution to the water resource.

The Priority 2 classification is appropriate because:

- the water resources have similar values to those of the Priority 1 area
- the land is predominantly freehold title
- most of the land has rural or unsewered special rural developments
- zoning and land use is generally compatible with Priority 2 classification.

Within urbanised areas, where water supply needs co-exist with other land uses, protection as a Priority 3 area is appropriate. This level of protection will minimise the risk of pollution through appropriate management. Four changes are recommended to the Priority areas proposed in the 1992 Water Source Protection Plan (shown in **Figures 4 & 5**).

These are as follows:

- Freehold land at the western end of the Water Reserve will be reclassified from Priority 1 to Priority 2. This recognises the rural zoning, land use and private land tenure.
- Part of the Priority 2 area north west of Pink Lake is crown land reserved for water and flora and fauna conservation. This area will be reclassified Priority 1, to ensure maximum long term protection.
- Reclassify the lots containing Esperance High School from Priority 2 to Priority 3. This recognises the existing land use more appropriately, particularly as the high school is not connected to deep sewerage.
- Reclassify a coastal strip of land (extending 500m inland) from Priority 1 to Priority 3. The Priority 3 strip would extend west of the town site to Eleven Mile Road. There is the need to allow development in the coastal area. Such development is unlikely to cause contamination of the public supply wellfield as the regional groundwater flow is away from the wellfield towards the coast. Management of the wellfield to prevent salt water ingress will maintain this groundwater flow.

Wellhead protection zones will be established around production wells. Wellhead protection zones have a radius of 500 m from production wells in Priority 1 areas and 300 m in Priority 2 and 3 areas. Specific fuel storage restrictions will apply within these areas.

8. Water source monitoring

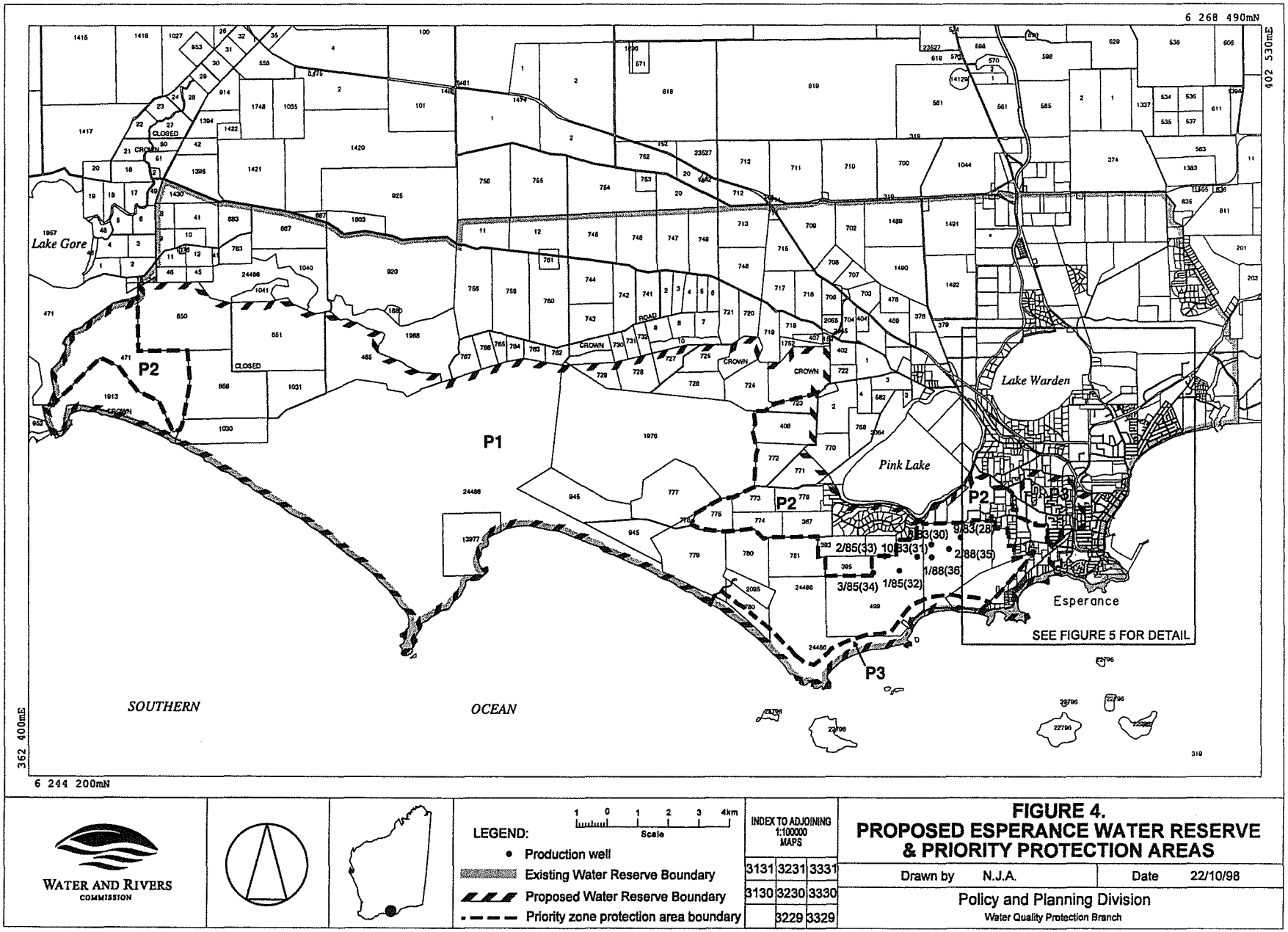
The Australian Drinking Water Guidelines (NHMRC and ARMCANZ, 1996) recommends that the key characteristics should be monitored for all public water supply schemes to allow early detection of contamination.

Key characterises should be measured as close to the water source as possible.

There are a number of potential contamination risks to production wells in the Esperance Water Reserve.

Several wells are sited in the urban, commercial and special rural areas of Esperance Water Reserve. Hydrocarbon, pesticide (including atrazine), nutrient (particularly nitrate), and microbiological contamination are known risks associated with these land uses. Monitoring for solvents in the commercial area may also be appropriate.

Regular monitoring of key characteristics for the public wells in the urban, commercial and special rural areas would be appropriate to detect any increasing trends at an early stage.



WATER AND RIVERS COMMISSION

LEGEND:

1 0 1 2 3 4km
Scale

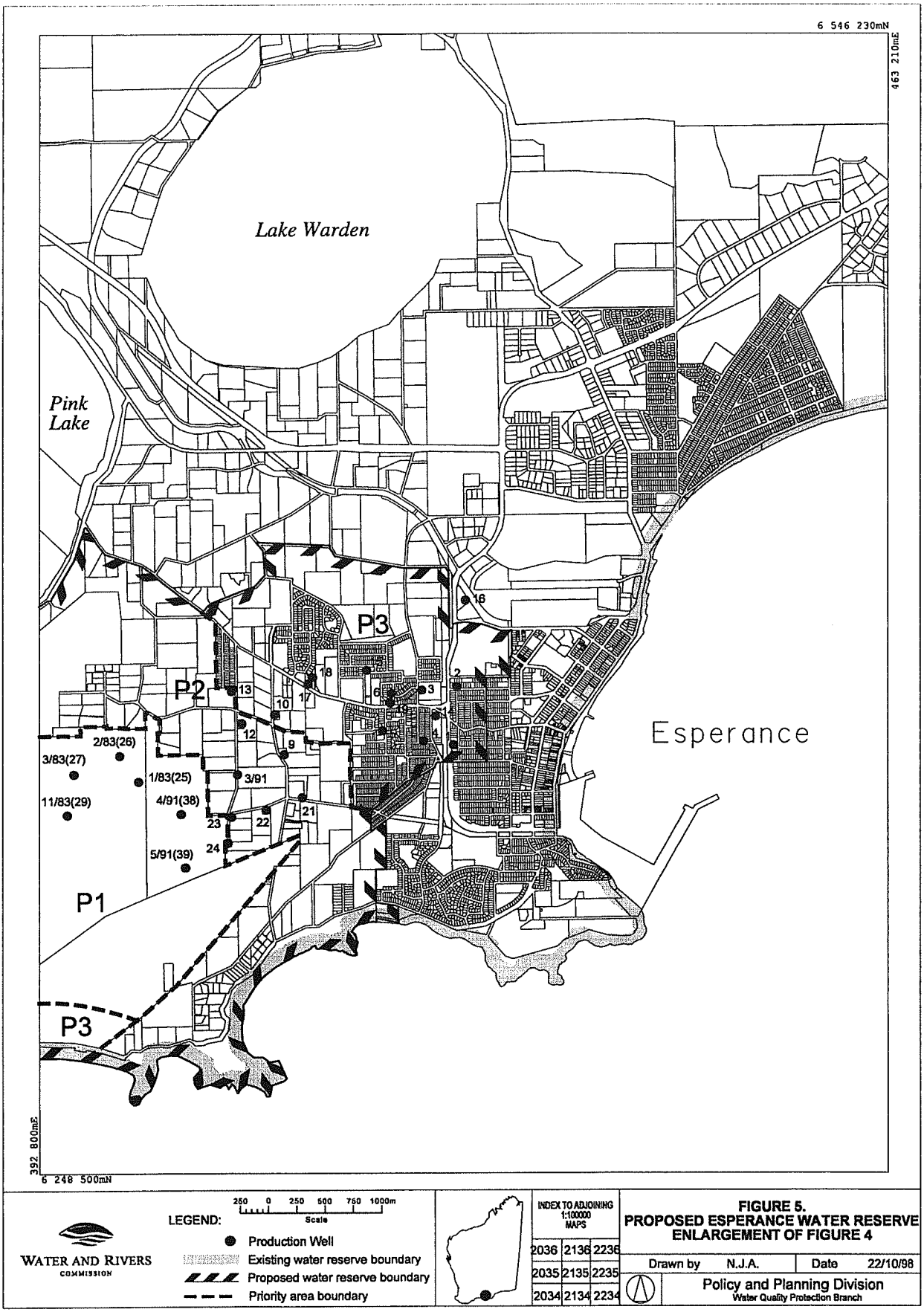
- Production well
- Existing Water Reserve Boundary
- Proposed Water Reserve Boundary
- Priority zone protection area boundary

INDEX TO ADJOINING 1:100000 MAPS		
3131	3231	3331
3130	3230	3330
	3229	3329

FIGURE 4.
PROPOSED ESPERANCE WATER RESERVE & PRIORITY PROTECTION AREAS

Drawn by N.J.A. Date 22/10/98

Policy and Planning Division
Water Quality Protection Branch


6 546 230mN
463 210mE
Lake Warden
Pink Lake
Esperance
P1
P2
P3
P3
2/83(26)
3/83(27)
1/83(25)
11/83(29)
4/91(38)
5/91(39)
3/91
392 800mE
6 248 500mN
WATER AND RIVERS COMMISSION
LEGEND:
250 0 250 500 750 1000m
Scale
Production Well
Existing water reserve boundary
Proposed water reserve boundary
Priority area boundary
INDEX TO ADJOINING 1:100000 MAPS
2036 2136 2236
2035 2135 2235
2034 2134 2234
FIGURE 5.
PROPOSED ESPERANCE WATER RESERVE
ENLARGEMENT OF FIGURE 4
Drawn by N.J.A.
Date 22/10/98
Policy and Planning Division
Water Quality Protection Branch

Recommendations

1. The proposed amendments to the Esperance Water Reserve should be gazetted under *the Country Areas Water Supply Act 1947.*

2. Planning strategies should incorporate the management principles outlined in the Water and Rivers Commission's document *"Acceptability of Land Use Within Public Drinking Water Source Areas"* (**Appendix 1**) and reflect the Priority classifications of the Water Reserve.

3. All development proposals in the Water Reserve that may impact on water quality should be referred to the Water and Rivers Commission.

4. Signs should be erected in accordance with Water and Rivers Commission and Water Corporation standards to define the boundaries of the Water Reserve and promote public awareness of the need to protect water quality.

5. Prepare and distribute educational material about pollution prevention within the Esperance Water Reserve.

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

- The Esperance Local Emergency Management Advisory Committee (through the Albany Emergency Management District) being familiar with the location and purpose of the Esperance Water Reserve.
- The locality plan for the Esperance Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team.
- The Water Corporation advising the HAZMAT Emergency Advisory Team during incidents in the Esperance 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.

7. Initiate a surveillance program within the Water Reserve to detect and monitor activities that may cause contamination.

8. Review the groundwater quality monitoring program of production wells to ensure key characteristic parameters are included. Routinely review water quality analysis results to detect any increasing trends.

9. Avoid overstocking on private land within the Water Reserve through use of appropriate clauses within the Shire of Esperance Town Planning Scheme. Particular attention should be paid to the land zoned special rural west of the town (proposed Priority 2 source protection area).

10. Assess the integrity of the Pink Lake Road service station's underground storage tanks, and hydrocarbon waste disposal systems. Negotiate upgrades as necessary.

11. Investigate the storage and disposal of chemicals at the Pink Lake Road drycleaning business. Negotiate upgrades as necessary.

12. Negotiate further upgrading of pollution control facilities with Western Power as necessary.

13. Close production well 16.

14. Support CALM initiative to include vacant crown land into the Butty Harbour Nature Reserve, subject to recognition of public water supply requirements.

Implementation of these recommendations should be reviewed one year after this plan is endorsed. The Source Protection Plan should be reviewed every five years.

Implementation Strategy

No	Description	Implemented by	Timing
1.	Gazettal of Water Reserve.	Program Manager, Protection Planning (WRC).	1999/2000
2.	Incorporation into land planning strategies.	Shire of Esperance, Ministry for Planning.	ongoing
3.	Rezoning, subdivision and development proposals: • WRC to provide the Shire of Esperance with guidelines for referral of development proposals. • Referral of all rezonings, subdivisions and development proposals to the WRC.	• Program Manager, Assessment and Advice (WRC). • Shire of Esperance, Ministry for Planning and Department of Environmental Protection.	• 1999/2000 • ongoing
4.	Signage: • Development of guidelines for signage. • Determine number and location of signs required. • Erect signs.	• Program Manager, Protection Planning (WRC). • Program Manager, Protection, South Coast Region (WRC) in consultation with Water Corporation. • Program Manager, Protection, South Coast Region (WRC)/ Regional Business Manager, Goldfields Region (Water Corporation).	• 1999/2000 • to be arranged • to be arranged
5.	Public education program : • Prepare and distribute material about pollution prevention within the Esperance Water Reserve.	• Program Manager, Protection, South Coast Region (WRC)/ Program Manager, Protection Planning.	• to be arranged

No	Description	Implemented by	Timing
6.	Incidents covered by WESTPLAN – HAZMAT in the Esperance Water Reserve should be addressed through the following measures:		
	(i) The Esperance Local Emergency Management Advisory Committee (through the Albany Emergency Management District) being familiar with the location and purpose of the Esperance Water Reserve.	(i) Esperance Local Emergency Management Advisory Committee (through WRC South Coast region).	(i) 1999/2000
	(ii) The locality plan for the Esperance Water Reserve being provided to the Fire and Rescue Services headquarters for the HAZMAT Emergency Advisory Team.	(ii) WRC (South Coast region).	(ii) 1999/2000
	(iii) The Water Corporation advising the HAZMAT Emergency Advisory Team during incidents in the Esperance Water Reserve.	(iii) Water Corporation.	(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) Esperance Local Emergency Management Advisory Committee.	(iv) ongoing
7.	Surveillance program:		
	• Develop guidelines for the surveillance of Water Reserves.	• Program Manager, Assessment and Advice (WRC).	• 1999/2000
	• Implement the surveillance program.	• Program Manager, Protection, South Coast Region (WRC)/ Regional Business Manager Goldfields (Water Corporation).	• on completion of guidelines
8.	Water quality monitoring program:		
	• Review the monitoring program as per the recommendations.	• Water Corporation.	• ongoing
	• Review monitoring program results.	• Water Corporation.	• ongoing
9.	Management of stock on private land.	Shire of Esperance.	ongoing
10.	Pink Lake Road Service Station:		
	• Assess integrity of underground fuel storage tanks.	• Program Manager, Protection, South Coast Region (WRC).	• 1999/2000
	• Negotiate upgrades as necessary.	• Program Manager, Protection, South Coast Region (WRC).	• as required

No	Description	Implemented by	Timing
11.	Pink Lake Road Drycleaners: • Assess chemical storage and disposal. • Negotiate upgrades as necessary.	 • Program Manager, Protection, South Coast Region (WRC). • Program Manager, Protection, South Coast Region (WRC).	 • 1999/2000 • as required
12.	Negotiate upgrading of pollution prevention facilities at Western Power's power station as necessary.	Program Manager, Protection Planning (WRC) and Regional Manager, Western Power.	as required
13.	Close production well 16.	Regional Business Manager, (Water Corporation).	2000/01
14.	Support CALM initiative to include vacant crown land into the Butty Harbour Nature Reserve, subject to recognition of public water supply requirements.	Program Manager, Protection Planning (WRC).	as required
15.	Review of this plan and recommendations.	Program Manager, Protection Planning (WRC).	• review implementation strategy annually • full review after 5 years

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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.
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 1 :

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 some development is allowed under specific guidelines.

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, **well-head protection zones** and **reservoir protection zones** are defined to protect the water source from contamination in the immediate vicinity of production wells 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 restrictions 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). Alternately 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.
Restricted	The land use may be compatible with the management objectives of the priority classification, with appropriate site management practices. All restricted developments / activities should be referred to the Commission for assessment on a case-specific basis.
Extensive	Where limited additional inputs are required to the land 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

Land Use Compatibility Tables

AGRICULTURE - ANIMALS

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

AGRICULTURE - PLANTS

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

DEVELOPMENT - COMMERCIAL

Land use	Priority 1	Priority 2	Priority 3
Aircraft servicing	Incompatible	Incompatible	Restricted[6]
Airports or landing grounds	Incompatible	Incompatible	Restricted[6]
Amusement centres	Incompatible	Incompatible	Compatible[6]
Automotive businesses	Incompatible	Incompatible	Restricted[6]
Boat servicing	Incompatible	Incompatible	Restricted[6]
Catteries	Incompatible	Compatible	Compatible
Caravan and trailer hire	Incompatible	Incompatible	Restricted[6]
Consulting rooms	Incompatible	Incompatible[7]	Compatible[6]

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

DEVELOPMENT - INDUSTRIAL

Land use	Priority 1	Priority 2	Priority 3
Heavy Industry	Incompatible	Incompatible	Incompatible
Light or general Industry	Incompatible	Incompatible	Restricted[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	Restricted
Civic buildings	Incompatible	Restricted[7]	Compatible[6]
Clubs -sporting or recreation	Incompatible	Restricted	Compatible[6]
Community halls	Incompatible	Restricted[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	Restricted[6]
Medical centres	Incompatible	Incompatible	Compatible[6]
Toilet blocks and change rooms	Incompatible[7]	Restricted	Compatible

EDUCATION / RESEARCH

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

MINING AND MINERAL PROCESSING

Land use	Priority 1	Priority 2	Priority 3
Extractive industries (sand mining, quarries)	Restricted[2]	Restricted[2]	Restricted[2]
Mineral exploration	Restricted[4]	Restricted[4]	Restricted[4]
Mining	Restricted[4]	Restricted[4]	Restricted[4]
Mineral processing	Incompatible	Incompatible	Restricted[4]
Tailings dams	Incompatible	Incompatible	Restricted[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	Restricted[6]
Food Processing	Incompatible	Incompatible	Restricted[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	Restricted[6]
Composting / soil blending (commercial)	Incompatible	Incompatible	Restricted
Vegetable / food processing	Incompatible	Incompatible	Restricted[6]
Wineries	Incompatible	Incompatible	Restricted

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	Restricted[8,9]	Restricted[8]
Special rural subdivision to a lot size between 1 and 2 ha	Incompatible	Incompatible	Restricted[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	Restricted[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	Restricted[1]
Motor sports ie permanent racing facilities	Incompatible	Incompatible	Restricted
Public swimming pools	Incompatible	Incompatible	Restricted
Recreational parks -irrigated	Incompatible	Incompatible	Restricted[1]
Rifle ranges	Incompatible	Restricted	Compatible

STORAGE/ PROCESSING OF TOXIC AND HAZARDOUS SUBSTANCES (THS)

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

TOURISM ACCOMMODATION.

Land use	Priority 1	Priority 2	Priority 3
Bed and breakfast accommodation	Incompatible	Restricted[16]	Compatible
Caravan parks	Incompatible	Incompatible	Restricted[6]
Farm stay accommodation	Incompatible	Restricted[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	Restricted
Landfills -Class IV and V	Incompatible	Incompatible	Incompatible
Recycling depots	Incompatible	Incompatible	Restricted
Refuse transfer stations	Incompatible	Incompatible	Restricted

Sewers (gravity)	Incompatible	Incompatible	Compatible
Sewers (pressure mains)	Incompatible	Restricted	Compatible
Sewage pump stations	Incompatible	Restricted	Restricted
Used tyre storage / disposal facilities	Incompatible	Incompatible	Incompatible
Wastewater treatment plants	Incompatible	Incompatible	Restricted
Water treatment plants	Restricted	Restricted	Restricted

OTHER DEVELOPMENTS

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

Table reference notes:

1. Restrictions include fertiliser and pesticide application.
2. Restrictions include the storage of fuels and chemicals, the depth of mining in relation to the water table with strict guidelines for rehabilitation.
3. Restrictions include the storage and use of fuel and other chemicals.
4. Subject to conditions placed on 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 on-site soakage disposal of treated wastewater. Restrictions 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 appropriate if well maintained.
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. Restrictions include 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. Restrictions apply on density of accommodation in Priority 2 areas.